MAIN CURRENTS

IN MODERN THOUGHT

Retrospective Issue

NOVEMBER 17, 1940 - NOVEMBER 17, 1975 *VOL. 32, NOS. 2-5*

MAIN CURRENTS

IN MODERN THOUGHT

FOUNDED IN 1940 BY F. L. KUNZ

A cooperative journal to promote the free association of those working toward the integration of knowledge through study of the whole of things, Nature, Man, and Society, assuming the universe to be one, intelligible, harmonious.

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ON THE COVER: "Emblem of the Primordial Water," design by Michael Sellon.

The purpose of MAIN CURRENTS is to present significant contributions to contemporary thought which point toward a unified vision of the world, by bringing into view the universal principles and modes of knowing in terms of which all cultures, ancient and modern, Eastern and Western, find their unique expressions. It seeks to bring forward achievements of the arts and sciences which display the forms and orders of nature as deriving from unitary principles which underlie both man's intuitions and his rational-empirical explorations. Its editors believe that each field of knowledge and realm of experience can be related to a wider context within which diverse perspectives integrate and enrich one another, and thus reveal a meaningful, value-laden ground for human action—the proper core of study at all levels of the educative process.

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Introduction to an Endeavor

There is in the modern mind a growing wonder at the baffling depth and immensity of the perspectives being opened up by science, and a growing sense that they are somehow grasped together within a supremely intelligible context having more dimensions than space-time—a context which man is perpetually engaged in reconstructing from the glimpses afforded him by the play between reality and understanding. Among the propositions which have steadily increasing interest are the following:

- *A cosmic unity in which man participates maintains supremacy of order under the veil of external events.*
- *The latent beauty, truth and worth in the cosmic space-time field must concern us no less than appearances do.*
- *Life is quite as primal as energy.*

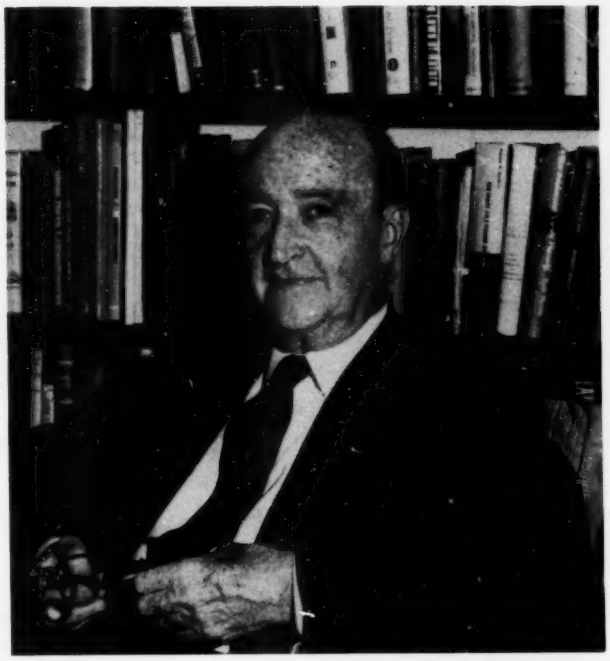
— F. L. Kunz, Main Currents, Vol. I, No. 1.

When, in 1940, F. L. Kunz and his colleague, B. L. Whorf*, were impelled to found a new journal, the world-picture evoked by the above statement was far from being the dominant or even the accepted view. Contemporary thought was still largely captive to the 19th century positivism stemming from classical Newtonian science, which held that matter as substance was the ultimate reality to which the whole natural world, including man, was finally reducible. Because of the growing dominance of science and technology, the end of the century witnessed a continuing erosion of the vision of man and nature which had characterized—indeed, had *created*—Western culture from the time of the Greeks.

It was not only on the physical level that man's world was changing so rapidly. Every aspect of human life was affected, for with the breakdown of the cultural tradition there came also a rejection of the metaphysics upon which the tradition was founded: its faith in an ordered, intelligible cosmos within which man's life had unique place and meaning. In denying anything but a material reality, the West in effect turned its back upon humanistic and spiritual values. It committed itself to the primacy of *things*, and to the pursuit of techniques for their measurement, manipulation and control—thereby losing touch with that unifying context which alone gives things their proportion, relationship and essential significance.

Although originating in the 19th century, the spread of materialism and positivism has had its most devastating effects in the social dislocations of the 20th, especially in the breakdown of educational traditions. The university in the United States, an outgrowth of British and European systems, was originally oriented toward the classics, long considered to be the indispensable foundation of a

*Metalinguist, and author of *Language, Thought and Reality*.



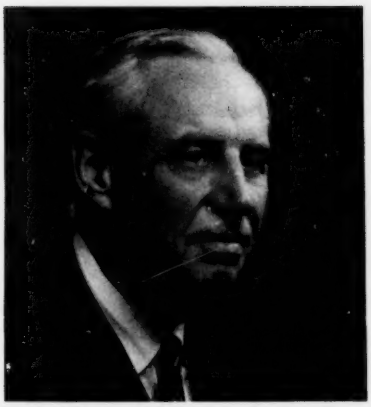
F. L. Kunz

cultivated mind. But the influence of technological pragmatism increasingly pressed education toward a more utilitarian goal: the development of "experts" whose training lay within narrow fields of specialization, and for whom a liberal education was considered an unnecessary waste of time. The humanities were thus relegated to a dilettante role, suitable for "enhancement" or personal enjoyment, while the sciences were elevated to the status of an ultimate, almost absolute value.

This situation so imperilled the unity and balance of the university—originally intended as a true "universe" of learning—as to threaten it with collapse. The scholarly world was aroused; studies were commissioned and remedies offered, notably the Hutchins Chicago plan and the Harvard study. These led to projects to revive the Western cultural tradition, like the Great Books program, and to proposals for general education programs of an interdisciplinary nature, to encourage study of the humanities. But none of these succeeded in their aims, for a very important reason: they failed to attack the central problem, the *fundamental* (not the immediate) cause of the cultural breakdown. As a result, general education could at best only paper over the deep gulf which lay between the humanistic idealism of the Western tradition and the pragmatic positivism of contemporary technological society. It could never effect a genuine integration of two such inimical views.

To Kunz and Whorf, the situation in 1940 was so filled with irony as to provoke the laughter of the gods, since the solution of the problem lay within the boundaries of the

Kirtley F. Mather



F. S. C. Northrop

Henry Margenau

problem itself. For just as it was science—that is, human understanding of nature and nature's order—that had created the crisis, so it was science that held the key to its resolution, and to a renaissance of meaning and value.

This key was to be found in the towering achievements of 20th century science, of relativity, field and quantum physics, which had revolutionized our concept of matter and with it, our whole understanding of nature and man as space-time phenomena. Paradoxically, while the *obvious* consequences of the new physics were changing the face of our world, the more *obscure* consequences—the far-reaching philosophical and metaphysical implications—were being overlooked by just those leaders of contemporary thought who should have perceived their importance. How could positivism survive in a world wherein matter was understood to be, at its root, not a "thing" but a complex, well-ordered, harmonious, aesthetic system of standing waves? Wherein principles of simplicity, elegance and beauty are all-powerful? The new physics proved, moreover, that human beings are able to penetrate beyond the world of appearance and of common sense to realms beyond our experiencing—to the non-material reality of universal fields as well as to the inner mysteries of the atom, that construct of pure reason. For the first time in history, man was approaching the ideal realities of the universe via science.

It was this new science, then, that held the means of recreating the metaphysical foundations of Western culture. For Kunz, committed to the values inherent in Platonism as well as to the non-dualism of the Hindu Vedanta, the prospect held not only the promise of a rapprochement of East and West in terms of their fundamental insights, but a modern, scientifically grounded confirmation of these insights. All that seemed needed for such an achievement was open recognition and appreciation of the sweeping perspective that science was so rapidly opening up for mankind.

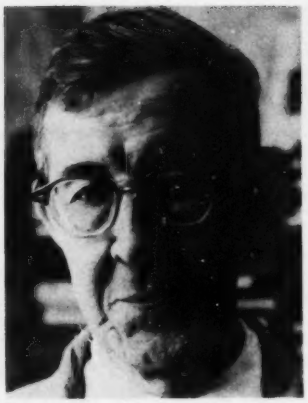
It was to win this appreciation that Main Currents was founded. Its role was to call attention to new and exciting fields of inquiry, show how these advances complement, support and enrich each other, and thus contribute to a vision of the whole. The journal was never intended (as some have thought its name implies) to embody those thought currents which flow conspicuously along the surface of our culture, following the winds of interest and opinion. Rather *these* currents were to be those profound underlying flaws which have both the depth and power to sweep across barriers and unify diverse fields.

The early issues, therefore, were almost entirely devoted to reviewing, reporting and commenting upon unifying trends in the physical and life sciences, psychology, and so on; F. L. Kunz and B. L. Whorf wrote practically the whole content themselves. From the first, they tried to avoid a didactic style, in order to encourage the reader to discern the implications of the material and draw the conclusions for himself. Our faithful adherence to this method has, it is true, sometimes baffled readers, but it represents a deliberate effort to enroll collaborators—not passive witnesses—in a holistic enterprise.

By 1947, the journal had won sufficient attention that a formal effort could be organized to provide a forum for the reintegration of our systems of knowledge. Accordingly, the Foundation for Integrated Education (now the Center for Integrative Education) came into being. Within a short time, its goals captured the imaginations of a number of eminent scholars who were actively exploring the deep connections of order and value in their own fields. A series of annual workshops and conferences was initiated at the University of New Hampshire in the summer of 1948; this was followed with conferences in 1949 at Wellesley College and, in 1950, at Stillwater, Oklahoma, whose Proceedings were published under the title, *The Nature of Concepts.*

Meanwhile, in December 1948 the first formal meeting of members of the FIE was held in the home of Mr. and Mrs. Julius Stulman at Larchmont, N. Y., where scholars and members of the industrial and business communities joined in affirming the integrative goals of the Foundation under the Presidency of Kirtley Mather, Professor of

Edmund W. Sinnott



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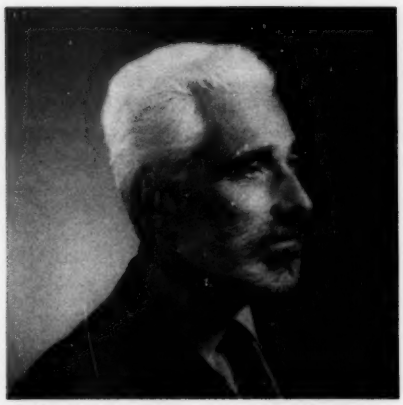


Julius Stulman

Geology, Harvard. Among those present on this important occasion were F. S. C. Northrop (philosophy of law and culture), Henry Margenau (physics and philosophy of science), Edmund W. Sinnott (biology), Harlow Shapley (astronomy), Pitirim Sorokin (sociology), Gerald Phelan (medieval studies), Clyde Kluckhohn (anthropology), J. B. Rhine (parapsychology), Oliver Reiser (philosophy).

Thus was mobilized the effort to reverse the decline of education, with its devastating effects upon our culture. In subsequent years, workshops, conferences and courses were held on almost an annual basis, and papers read at these meetings found their way into Main Currents. The journal became the official organ of the FIE; the Foundation became the context of Main Currents.

Implementing the concern of Kunz and Northrop to bring about a "meeting of East and West," the FIE made special efforts to emphasize the convergence of the Eastern metaphysical traditions with Western theoretical science. It was plain that world civilization was undergoing a radical transformation in which the non-Western countries would play an increasingly important role; thus it was imperative to perceive the bases of unity within these different cultures. For (to quote the remark of the Chinese philosopher Mo-ti which dedicates Northrop's discussion of East and West): "Where standards differ there will be opposition. But how can the standards of the world be unified?" In the pages of Main Currents the compatibility of Eastern philosophy and Western science was a major theme; to carry the message in the opposite direction, cooperative work was carried forward by F. L. Kunz at several Indian universities, under the sponsorship of the Indian Department of Education.

During its history, the Center for Integrative Education has never been able to realize its ambition to mount a full-scale experimental program on the campus of a liberal arts college, and so develop a method, as well as a philosophy, of integrative education. Yet it has to some degree achieved its goals through its journal. Main Currents has served the CIE in two ways: on the one hand it has gradually gained wider respect for the Center's unifying perspective; on the other, it has helped to broaden and sharpen that perspective. It has taken time for the full importance of the epistemology advocated by Margenau and Northrop to be appreciated. In its early days, the Center's emphasis was upon conceptual integration, upon the fundamental principles which give unity to the great domains of knowledge. But it is now recognized that the theoretic or rational component can never be separated from the living realm of experience—either in theory or in practice. All true knowledge arises from the integration of two domains of knowing—the perceptual, aesthetic and experiential, and the abstract, theoretical or conceptual. Both these modes must be nurtured if we are to achieve personal integration and wholeness; both are essential for the growth and renewal of our culture.

The whole can therefore never be comprehended in words or thought alone; it is always more than "this" or "that," as the East has recognized. Main Currents' pursuit of this elusive vision (which may be glimpsed anywhere or everywhere if one truly looks for it) has led us to seek the seeds of integration in fields which have long lain fallow. It has attracted us to obscure themes, neglected possibilities and unanswered questions. Our journal has been privileged to owe no allegiance save to its own goals, and to exercise its freedom to publish the most unconventional wisdom, the most daring speculation, if it seemed to point in the direction toward which we hoped to advance.

Some of the papers offered in this retrospective of thirty-five years of publication will startle today's reader only if he looks at the date of original publication; to this extent, ours has been a prophetic vision. At long last, the three great horizons under which F. L. Kunz originally categorized our areas of search are now seen as but aspects of one whole—the total world of human being. In one way or another, however, each of the papers which follow is integrative to the degree that it succeeds in breaking through these horizons to a higher level synthesis within man's conscious life. For it is this level, this unifying ground, which provides the meaning and delivers the reality of man and world. — E.B.S.

Nature

HENRY MARGENAU

The Method of Science and the Meaning of Reality

The Fullness of Human Experience

MODERN SCIENCE REVEALS THE IMMATERIALITY OF THE PHYSICAL WORLD

IMPORTANT CHANGES HAVE OCCURRED in Western man's conception of what is real, and these changes are manifest in contemporary thinking in the sciences as well as the arts. The scientist has moved away from reliance on solid matter and on what is directly inspectable; the artist's imagination no longer clings to facts representing sensory occurrences but accepts the sensory material itself, or ventures far into the fanciful, non-representational domain.

The scientist's mind is open to both fact and fancy. Flights of fancy, venturesome conjectures, beautiful mathematical conceptions, mark his activities in ever-increasing measure. Einstein's brilliant conception of the equivalence of mass and energy, later tested in the laboratory and by the facts of the Alamogordo explosion, is the most famous and one of the most momentous of such scientific achievements.

Yet there is a difference between the way the scientist responds to facts and fancies and the way the artist does. The scientist endeavors to hold them in balance, to control fancy by fact and fact by fancy, while the artist often disregards all checks and balances, at least in the strict sense here under study. How the scientist establishes that control is the subject of the first part of this essay.

To be sure, he is not likely to use such indefinite words as facts and fancy; he prefers to speak, more soberly and with lesser risk of misunderstanding, of results of observations, sense data, perceptions and measurements instead of facts, and he translates fancy as hypothesis, concept, theory, or idea. There is a deep chasm between sense data, which are directly perceived in the world, and concepts, which our mind creates; scientists and philosophers throughout the ages have been appalled by depth of this gulf, and have tried to bridge it. Before turning to these questions, however, we will deal with an even more general problem.

To gain fullest understanding of science one must ask what it does to man, in what manner it transforms and enhances his experience. Only when this is clearly seen will the peculiar competence of science—and also its limitations, its benefits and its shortcomings—move into view. Let us see, then, how science fits into the totality of human experience.

Experience has many forms; every time man uses his senses, when he thinks, values, judges, or is subject to an emotion, something peculiar to the occasion

is added to it. Language is not rich enough to describe the living forms of experience, and words such as thinking, feeling and all the rest cannot do full justice to its ever-flowing living stream. Yet despite its multiformity and its flux, experience has a discernible ingredient which looks to *knowledge*—knowledge as distinct from emotions, wishes, hopes, and aesthetic satisfactions. The component oriented toward knowledge includes *sense perceptions, observations, and thinking*, and the last involves common sense at one end of the range, and the lofty reasoning of the mathematician at the other. These activities or experiences, which go into the building of the edifice called scientific knowledge, are sometimes called *cognitive*—in contrast to feeling, hoping, wishing, willing and various affective states. Cognitive experiences are the stuff of which science is made.

Notice, then, that the material of science *excludes* certain modes of human experience: Science does not concern itself, at least in its present forms, with many aspects of beauty, with the subjective but nonetheless genuine, simple joys of living, with uncontrollable fate which engenders both ecstacy and desperation, with moral imperatives, nor with the problems of evil and of sin. But it renounces its concern with them deliberately, in full awareness of the restrictions which this resignation imposes, and it does so in order to gain power in the smaller province of cognitive human experience which it sets itself to organize, to predict and to control.

Hence arise certain limitations in the competence of science. Let it be said in passing, however, that the scientist is also a human person and as such has interests that go beyond his science. The limitations of science, therefore, do not necessarily restrict the competence of the scientist as a man. His extrascientific interests may be strong or weak, informed or superficial; whatever their qualities are, they are made neither less respectable nor more authoritative by the fact that his primary discipline excludes them. To suppose that a scientist's judgment on political or religious matters is generally untrustworthy or, conversely, generally authoritative is a fallacy of the same sort as the belief that a painter cannot be a good carpenter or that, by virtue of being a painter, he is a better carpenter.

With our analysis of experience, our selection of the cognitive components that lead to knowledge, we have entered a field called "theory of knowledge" or epistemology (*episteme*, Gk. = Knowledge), one branch of which is the philosophy of science. It has a venerable history, and features men like Plato, Aristotle, Hume, Kant, and Einstein in the West, or Kanada, Gautama and Shankaracharya in the East. The central question of epistemology concerns the relation between *sense data* on the one hand and the general, universal *ideas* to which sense data give rise in men's minds on the other; it asks, how are the particulars of perception translated into the sweeping generalities often affirmed in the laws of nature?

At first this query may seem far-fetched, but it is a fact that the best minds have been arrested by it. Plato, particularly, was struck by the fact that ideas have a life of their own, that they somehow belong to a higher realm than things. Men have counted pebbles and seashells along with their fingers and toes, and they have gradually learned the rules of arithmetic. But if there were no pebbles and seashells, indeed no objects at all, man's mind, it seemed to Plato, could still conceive the *idea* of number, and it could know the laws of arithmetic even if there were no things to count. And he would be right, for mathematicians have often discovered ideal structures like irrational numbers with their own lawfulness, although these ideas represented (at least at the time of their discovery) nothing real and particular in the world.

The art of the mathematician may have a super-empirical significance, but one might ask whether the physicist, the chemist, the astronomer, the biologist do not have to stick to direct observations and experimental findings—to things and events that can be seen and heard and touched and smelled. Do such scientists ever worry about immaterial aspects of reality?

The almost unanimous answer of the 19th century Western scientist would have been, "No." But things have happened that now make this answer unsatisfactory. We can see this best, perhaps, by following the sequence of pictures, or models, that have lead to the present concept of the atom and its most active and best known constituent, the electron.

Atoms and Electrons

At all times, the evidence for the existence of this elusive "particle" was circumstantial, for the atom is too small to be seen or to be detected by the sense of touch. But so are microbes and many other things that can be made visible under a microscope. Since a microscope provides a perfectly natural extension of our sense of vision, there can be no question as to the reality of the microbe. One may truly say that some things too small to be seen directly are nevertheless objects of sense perception, albeit perception aided by external devices. So far as the microbe is concerned, no essential departure from the solid realm of the "given" in nature has occurred. The atom, too, has long been thought of in this sense—as a small pellet of impenetrable stuff, essentially visible and touchable except for its smallness. Let us take a brief glimpse at its history.

Evidence for the existence of atoms was indirect. Leucippus, its Greek protagonist, thought he felt the aggregate effects of its impacts in the force of the wind and in the turbulence of boiling water. Democritus equipped it with hooks and locks in an attempt to explain why solids hang together. Kanada, the Hindu scientist, at about the same time called upon the atom to account for the structure of the mote in a sunbeam. As time went on, the atom served more and more satisfactorily for a greater variety of purposes. It became the basic constituent of all elements, the entity which remained unchanged in chemical reactions, the unit out of which molecules are built. In the case of a

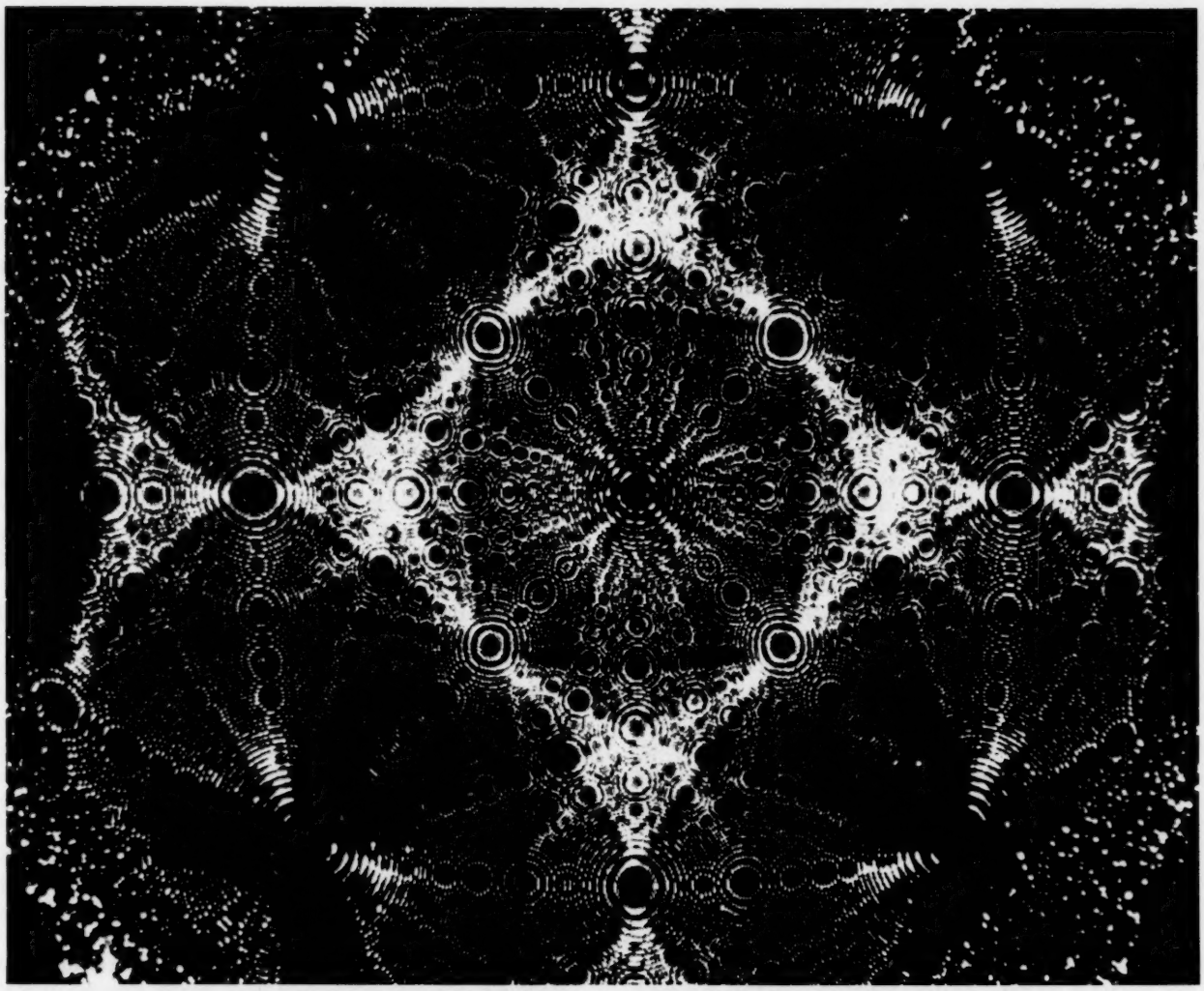


Fig. 1. Hemispherical platinum crystal as seen in 700,000 x magnification in the field ion microscope, revealing the symmetry of the crystal facets. Photograph courtesy of Prof. Erwin W. Müller, The Pennsylvania State University.

gas like helium or argon, atoms are the bouncing bits of matter which, through their impacts on the walls of a container, create the force which we observe as pressure. It is always the *effect* of the atom's action that becomes manifest to sense, never the atom itself.

But there are some experiments in which it can *almost* be seen. A liquid consists of molecules, each of which is a small cluster of atoms held together by attractive forces. Nobody has ever seen their haphazard irregular motion. But a small foreign particle, visible under a microscope while suspended in the liquid, is easily observed to perform a crazy zig-zag motion which suggests that the particle encounters invisible but rapidly moving smaller bodies and partakes of their motions as it collides with them. The ceaseless random walk taken by the particle (which may be the constituent of an emulsion) was discovered by the botanist Brown in 1827; it was taken to "prove" the existence of molecules and atoms in motion.

The most concrete demonstration of the actual existence of atoms is by way of pictures like those taken by E. W. Muller of atoms on a crystal surface. (Fig. 1) The small white spots mark sites of single atoms on the surface of a metal, vastly magnified by an ingenious arrangement involving an electron microscope. Such pictures ease one's mind and cause one to think that, after all, an atom *is* a tiny blob of matter, perhaps of complex internal structure but in essence like all the familiar objects around us, only smaller.

But an annoying thought assails us at this juncture: Is this difference in size truly trivial, or does it involve something more serious than first expected? To make sure, let us perform a thought experiment. Imagine, for instance,

that a blue ball one inch in diameter shrinks in size. Does it retain all its properties as it gets smaller? When it reaches a diameter of about 1/100 inch it ceases to be visible, but this is not a serious difficulty for we can easily use a magnifying lens or a microscope to restore it to vision. It will still be blue, round, and have a definite detectable size.

At one ten-thousandth of an inch, however, something rather drastic happens. Blue light has a wave length of about 0.0002 in.; anything smaller than this cannot reflect light and therefore has no color. Nor does this mean it will look black. Its appearance can simply not be imagined; to the mind it will be as unpictorable as 4-dimensional space. Its shape and size, to be sure, remain meaningful, for they can still be ascertained by other means. One can, for example, cause non-visible light of much smaller wave length to be reflected from the object to determine its shape and size.

But let us continue our thought experiment of shrinking the ball even further (keeping its density constant). At a diameter of 10^{-10} inch, (.0000000001 inch) it is about as large—and much lighter in weight—than the usual atomic projectile, which is the electron. If, therefore, we probe its properties by shooting electrons against it and watching their rebounds, (which is precisely what our eye does with photons of visible light) we do the equivalent of bombarding a ping-pong ball with a cannon in an attempt to discover the ball's shape and size. This experiment can never yield an answer to the questions, is it round? and what is its diameter? Indeed further inquiry and experimentation of this or any other kind reveal that there is no way whatsoever that will provide answers to such questions. Are we then still entitled to attribute to something which is too small to be seen, too small to have its size and shape determined, the ordinary attributes of visible things? Does the atom *have* a color, a shape, and a size?

Nobody, including the scientist, *likes* to say no. But he will say no if he must, that is, if nature provides him with no means at all to determine these attributes in meaningful ways, not even when he is willing to rely on circumstantial and indirect methods of observation.

As a matter of fact, this latter contingency has arisen. Scientists clung to their visual intuition as long as this furnished a shred of validity. They pictured the atom first as a solid sphere, then as a raisin pudding (the pudding being a sort of jelly of positive electric charge, the raisins negative electrons) and, finally, as a planetary system.

The last of these visual models is a famous one proposed in 1913 by Niels Bohr. It represents the hydrogen atom as a planetary system in which the proton replaces the sun and the electron a single planet. The proton is 10^{-13} cm in diameter and 1,840 times as heavy as the light and fluffy electron, which is 1,000 times as large as the proton. The distance between the two is approximately 5×10^{-9} cm, and the electron, acting like a large but incredibly swift cloud, revolves about the proton about 10^{16} times per second. If the structure were magnified by the factor 10^{13}, the proton would be the size of a marble, the electron a 30-foot balloon, 1/3 a mile away. A person standing on earth, correspondingly magnified, would be 10 billion miles tall and his head would extend well beyond the solar system.

This model accounted with amazing success for the light emitted by the hydrogen atom. The electron's motion produced a sort of "harmony of the spheres" which became visible in its spectrum. But the electron continued to hide itself from view. In the first place, as we have already seen, it is in fact far too small to have the usual attributes; nothing on earth can serve as a probe for its position, its size or its shape without interfering with its condition of existence. Then there are further difficulties peculiar to all the denizens of the atomic world. These are important and need to be sketched here.

Suppose there were a kind of light which the electron could reflect, and suppose the reflected light were found to come from a definite point on its orbit. Could it then be said to have been found at that point? Experiments of this sort can actually be carried out with X-rays. They would allow the position of an electron in its orbit to be inferred *if reflection were an instantaneous event.*

Bohr's theory, however, which claimed the existence of these orbits, also implies (by virtue of the electrodynamic theory it relies on) that a certain *time* is required for any signal to be reflected. In this instance that time is about 10^{-10} seconds; the electron needs at least that much time to interact with the light wave, i.e. to "tell the light wave where it is." The number of orbits described in 1 second is, according to Bohr's theory, about 10^{16}. Hence in that minuscule interval the electron revolved many million times! Clearly there is something wrong with a theory which suggests that an object is at a certain place at a certain time and in the same breath denies every possibility of verifying that statement.

Innumerable difficulties of this sort arose in connection with this still most persuasive Bohr model. The theoretical physicist of the 3rd and 4th decades of the present century was assailed by many doubts and heartaches, but he finally decided that the trouble for the most part arose from his attempt to *picture* the electron after the fashion of visible things. Regretfully he concluded that things too small to be seen may not have visual attributes. The electron thus became a more symbolic and shadowy entity, as potent and real as ever, but the carrier of qualities that derived more from the scientist's reasoning than from his direct observations. It became a concept partaking in a measure of the attributes of Plato's ideas, but with important counterparts in the world of observations. This is what is meant by the modern physicist when he says, somewhat obscurely perhaps, that the electron does not *have* a position at all times, that it does not *have* a definite size, that it behaves sometimes like a wave and sometimes like a particle. The mystery disappears from these paradoxes when it is remembered that one has no right to attribute positions, sizes, shapes, and colors to things which, by their very nature,

cannot bear such qualities. One might as well assign smell to a lightbeam.

Some say that the atom taught the scientist the lesson of Genesis: "Thou shalt not make thyself a graven image. . . ." If so, the question raised in the beginning of this chapter looms larger than ever: What is fact and what is fancy? And what is the relation between the two? In this way we have been forced to reflect upon a *philosophic* problem, and the problem concerns the relation between the observable data of the scientist and the concepts with which he reasons, between facts and ideas. The ghost of Plato walks again in our midst.

These two kinds of experience, observational data and ideas, are welded together into a union called "reality" in the scientist's workshop.

The Blindness of Facts

Data are the events occurring in nature, or rather, strictly speaking, our observation of them; in recent years they also include events and observations on the behavior of men and societies. But events and observations—that welter of actual happenings about us—are opaque in their meaning unless they are illuminated by ideas. Only then will they satisfy the scientist's curiosity and his desire to predict. Bare facts do *not* speak for themselves; the ideas they reveal are neither directly implied nor are they unique. This is illustrated by numerous jokes, of which the following is typical: A teacher, after telling the "facts" in the story of Jonah and the Whale, asked her class: What is the *meaning* of the story? One child answered, "Whales get sick from eating people." Her answer was as correct as any other. Facts by themselves teach nothing.

This is the trouble with all mere facts before they are pervaded and made significant by theoretical meanings. They are unrevealing, insular, lacking the degree of cohesion which our reason desires. If the scientist had to build his knowledge of the world out of the ever-emerging-and-perishing particulars of factual observation, without interpretation through ideas, his knowledge would be primitive and chaotic, meriting neither the name of science nor of philosophy.

When a Greek author planned a book he would write upon a sheet of papyrus all the unrelated items which were to be explained and organized into a coherent body of knowledge within the book. This table of contents became the first leaf of the book, presenting a sort of skeleton sketch of its purpose. The Greek word for first leaf is "protocol." Because the events and observations—matters we have here referred to as *facts*—are related to the whole of science much in the way the protocol is related to the entire book, the data and observations of the scientist are sometimes called protocol experiences or simply protocols, and it is with these that the scientist begins his work. Their detailed nature differs from one science to another.

In physics, protocol experiences relate primarily to forces, matter, and energy; they include the study of what happens when a push of measured strength is applied to a body, or how much light a solid will emit when it is heated to a certain temperature. Among the protocol data are observations on the pressure of gases at different volumes and at different temperatures, on the electric currents that flow in wires and in discharge tubes. Others are the record of what kinds of radiations are given off by radio-active substances, or what strange events take place when matter is bombarded by atomic projectiles.

The old-style astronomer confined his observations to the movements of the nearest heavenly bodies; today his telescopes examine all objects in space to a distance of several billion light years; indeed some branches of astronomy have been transformed partly into experimental sciences whose basic observational facts include laboratory studies of the nuclear reactions which take place in stars.

Biology and psychology, as well as chemistry, also make myriad wide-ranging observations, extending from elements through microscopic structures to behavioral studies. All of these show that scientific concern rises from knowledge of what is the case in terms of observations. The social sciences, too, start with basic facts of observations; even if observations of the behavior of people are a more difficult and remote activity, they remain the protocols of these sciences.

The Role of Concepts and Constructs

Atom and electron, whose character has been traced, are first of all concepts, ideas. The protocol data which hint at them are such matters as the force of the wind, the turbulence of boiling water, the zig-zag of particles in Brownian movement, the light emitted by incandescent gases, little streaks on photographic plates, the twinkling of the picture on the TV screen—and countless others.

Thus every science has a firm foundation of observed facts upon which it builds its theoretical structure. But what precisely is this conceptual or theoretical structure, and why is it needed if the facts are already at hand?

The answer is paradoxical but clear and striking: Protocol facts alone have no intrinsic fascination for man. By themselves, facts are trivial, devoid of meaning, unconnected, disorderly. If they are to take on meaning and significance they must be embedded in a texture of relations which allows them to be seen as instances of a larger human concern, as examples of universal principles. Hence the need for the ascent from the particulars of protocol fact to the loftier stratum of ideas. Science makes that ascent when it builds, above the base of facts, the superstructure of theories. It was the uncanny, the seemingly miraculous nature of this passage from facts to reason which gave pause to Plato, Aristotle, Hume, Kant and Einstein.

Each of these men contributed to our comprehension of the relation between facts and ideas. Today, for example, every scientist agrees with Kant's appraisal of the two functions, sensory perception and reason. "Concepts without factual content are empty," he wrote, "sense data

without concepts are blind. Therefore it is equally necessary to make our concepts sensuous, *i.e.* to add to them their object in intuition, as it is to make our intuition, intelligible, *i.e.* to bring them under concepts. These two powers or faculties cannot exchange their functions. ***The understanding cannot see. The sense cannot think.*** By their union only can knowledge be produced." Thus, facts are blind until enlivened by ideas, but ideas are empty until they receive factual confirmation.

Einstein had this to say about the problem: "The concepts which arise in our thought . . . are all—when viewed logically—the free creations of thought which cannot inductively be gained from sense experience. [That is to say, the facts do not dictate the scientist's fancy.] . . . This is not easily noticed only because we have the habit of combining certain concepts . . . so definitely with certain sense experiences that we do not become conscious of the gulf—logically unbridgeable—which separates the world of sensory experiences from the world of concepts. . . ."

Science, we have seen, is a special way of organizing experience, of making crude perceptions and other immediate kinds of awareness meaningful. Experience is a very indefinite term. It embraces items which lead to knowledge (cognitive experience); it has phases of pure satisfaction and enjoyment which may not clamor for understanding and are therefore sufficient in themselves (pure aesthetic experience); it contains all sorts of feelings which may or may not lead to actions. Science addresses itself to the *cognitive* component of experience. In a certain sense this statement is redundant, for experience becomes cognitive when science, or agents like science, succeed in organizing it.

The starting point of cognitive experience, and hence of science, is what we have called protocol data. These are intrinsically hazy, subjective, unstable, continually springing into being and perishing within our consciousness. Nevertheless they are the irreducible starting points of the scientific enterprise and also the termini against which scientific reasoning must ultimately be tested.

The passage from protocol experience to cognitive experience is assisted by the process of *reification*, which merits special attention. It represents the way in which common perception, the forerunner of science, organizes the world of experience. The crude protocol facts which engender the idea of an external object, such as a book, are a vague conglomerate of items of awareness: a certain shape, color, the feeling of weight in my hand—all these are fleeting impressions which disappear when my attention turns elsewhere. Yet they return when my awareness is again focussed upon them. To understand their reemergence we construct the idea of a self-identical object, a book, endowed with a permanence which the incoherence of my primary impression does not convey, or strictly speaking, justify. Yet somehow this association of a permanent object with evanescent data of consciousness is successful in organizing mental experience. We call it "reification," the postulation of a *thing*. It leads from perceptual experience to constructs called things, and in a simple figurative sense these constructs lie very close to the perceptual plane.

The means therefore, whereby the ascent from facts to ideas is made possible is via constructs, the mechanism whereby perceptual images are transformed into conscious ideas. In real life, the final idea and the original sense perception are not simply related: no absolute, invariant rules are known by which the nervous system guarantees a one-to-one correspondence between image and object. It must be concluded, therefore, that the simplest and most direct images that we perceive are *mental constructs*, not sense data.

In regard to the theory of knowledge, the following statement is significant: *All* our knowledge is based on constructs. All the rules by which we judge the truth of an idea are based, strictly speaking, on the testing of constructs by constructs. Even the requirement of empirical verification is of a constructional character insofar as it relies on deliverances of the senses. This analysis emphasizes, in turn, the tentative nature of all human knowledge.

The philosophical problem of the scientist, then, is the transition from the data of sense perception to the concepts of reason, and the validation of such concepts. It is this problem which has given rise to the scientist's basic strategy.

The Method of Science

Discussion of the transition from facts to concepts can be introduced by a simple example.

The brute and qualitative fact of hotness is the pain I feel in my fingertip when I stick it into a steaming bath. The fact is unpleasant but, by itself, unproductive unless I link it with other facts such as, for instance, that I forgot to open the coldwater faucet. Even so, this is a very primitive scientific connection. If science is to take a firmer hold of this situation it must do two things: *First*, it must stabilize the meaning of hotness by taking it out of the context of subjective perceptions, by establishing the *idea* of *temperature* beyond the vicissitudes of the feeling in fingertips, which is greatly conditioned by previous exposure of the finger. *Second*, it must seek logical connections between the concept temperature, thus stabilized, and other concepts. Here enters the important notion of *measurement*.

To make hotness *objective* and *measurable*, the scientist invents a thermometer whose reading is reliable, reproducible, and quantitative. The late Professor Bridgman of Harvard University has coined the phrase "*operational definition*" for the relation between hotness and temperature, saying that the quantitative concept, temperature, is *defined* operationally, i.e. by the use of a physical instrument (thermometer) in a situation where we would subjectively experience the sensation of hotness. All it means is that scientific quantities are made objective by *measurements*. Here, then, the scientist takes the first small step

from the world of sense impressions to the world of concepts or ideas, for while hotness is a sensory protocol fact, temperature is a little more abstract because it implies a number, and thus acquires some of the qualities of ideas. The scientist's measurements offer the beginning of the link between fact and fancy.

The measurement of temperature is obvious and primitive. Nevertheless what we encounter in the initial confrontation with a subjective sensory experience—whereby the use of an instrument makes that sensation stable and objective and finally leads to the ascertainment of a number—is typical of all scientific concepts that have attained quantitative precision. For instance, time, in its most immediate actuality, is a mere subjective datum. The inner sense of time which accompanies the flow of consciousness in every person's private awareness is irregular; its passage is quick when we are intent, slow when we are bored. We can appraise it by counting heart beats, but the human pulse is not reliable. Hence the first stage of refinement and stabilization of the experience of time is enacted when the scientist selects a device called a clock and compares intervals between events with counts of pendulum swings or clicks of seconds, or with astronomical cycles. This makes time numerical; the measure of its passage becomes objective. The advantages of objective, interpersonal and hence *public* time are evident for the kind of description and prediction of events which the scientist attempts—and this may be recognized without disparaging the personal, subjective content of individual time experience, which lends so much color and variety to life.

Let us return to the elusive, invisible electron, on which so much of modern science depends. The first step toward understanding the electron is through measurement, for it is by such "operational definitions" that the scientist apprehends its mass, its electric charge, its spinning motion and its magnetism. For each of these there exists a measuring instrument that puts the affidavit of reliability on a certain fleeting sense impression, and out of the numerically precise and reproducible values of such measured quantities as mass, charge, etc. the *concept* of the electron is built.

In sum, then, it is the act of measurement, in its largest sense, which takes the scientist from the protocol domain of immediate sensory fact, from direct observation, to the realm of concepts. But measurement is not enough to make the concepts useful, or to satisfy the scientist. Measured temperature, standing alone, is hardly better than an isolated sensory fact. Hence the scientist takes the second step, that of establishing relations. For this purpose he needs *theory*, which plays an important role in establishing science and what is called scientific reality.

To provide *meaning* one must seek logical connections between one operationally established concept and others. These logical or mathematical connections are the laws and principles of science, and their discovery is the business of the theoretical or mathematical scientist. In the example of temperature, as measured, such connections are well known. For example, we know a connection between temperature and pressure: The air in a tire takes on a pressure (measured by means of gauges) which is in proportion to its temperature. The science of thermodynamics is full of relations between the temperature and numerous other measurable quantities. Their study comprises the physics of heat phenomena.

Further, if clock time is to be scientifically useful it must be connected with other concepts, measured time, combined with measured distance, yields velocity, which is distance divided by time, and velocity is involved in the laws of motion. The law which states that bodies travel with the same unvarying velocity in the absence of forces is true if, and only if, distances and times are measured in suitable ways. Hence the scientist always *chooses* his method of measurement to bring about maximum logical affinity between the operationally defined concepts. He invents measurements which have the best chance of yielding a logically fertile structure of concepts. This makes the business of measuring more than a routine of handling instruments: It offers a major theoretical challenge, even to the experimental scientist.

In the case of the electron, above all, concepts like mass, charge, spin, and magnetism, as defined by measurements, combine and interplay in most striking fashion and give rise to some of the most elaborate and beautiful theories of modern physics.

The superstructure which science builds upon the basis of directly observed protocol facts is thus constructed in two stages: The first is a refinement, a stabilization of the raw data by means of suitably designed instruments. The second stage is the search for rational order, for laws and principles among the concepts which are operationally defined.

It is not only in the physical sciences, from which most of our examples have been drawn, that we observe this methodology at work. The rise above the directly observed protocol facts by way of stabilizing measurements, followed by a quest for theoretical connections between the concepts which measurements have established, is seen in all areas of science.

We have been at some pains to show that the scientist, once regarded as a person who goes around searching for "facts"—digging up novelty by careful experimentation, turning up rocks to see what is under them—does indeed far more than that. He creates, constructs, ideas *vis a vis* these facts, and sets them into harmonious relations.

But if this is true we seem to encounter a puzzle. To return to our example of the electron, we tried to show that it is an idea which cannot be wholly reduced to qualities that ordinarily parade as sensible facts since it is invisible, devoid of color, and so forth. Is it then *only* an idea, is it not real? The scientist insists that it is, for the following two incontrovertible reasons.

First, everything that can logically be inferred from the idea, electron, and is then measured by the techniques es-

tablished, is actually found in the domain of protocol experience. Second, the laws and principles employed in the reasoning about electrons are the simplest the scientist can discover; they are elegant and pleasing in a sense dear to mathematicians, they display what philosophical scientists have called economy of thought. Reality is the attribute of entities which, once postulated on the basis of carefully conducted measurements, are, first, verified in terms of all their observable consequences and, second, arrange themselves in a network of laws and principles that appeal to man's reason because of their orderliness and, yes, their abstract beauty.

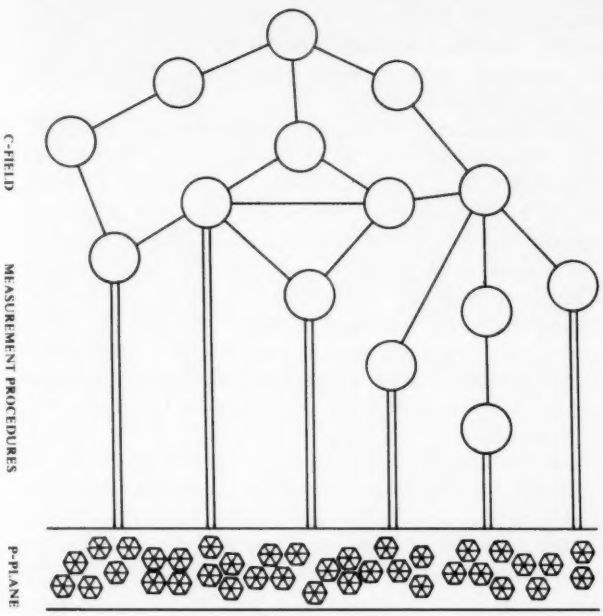
Here, then, is what the scientist asserts when he attributes reality to electrons. They are entities whose properties he can define with clarity and precision. These properties enter into universal laws of nature which, by virtue of their simplicity, elegance and other *aesthetic* qualities, capture man's fancy. And finally, they lead to consequences in the realm of observable protocol facts which are found to be empirically true. But the scientist does *not* wish to imply that electrons are material in the ordinary meaning of that word, nor that they are directly accessible to sense.

Modern science has turned up a great many realities which share the invisible qualities of electrons, atoms and genes. Some are called fields. The continua known as space and time are amongst them.

A bird's eye view of the scientist's multifarious activities may be suggested by a little sketch. This pictures a solid groundwork of directly observed facts. These facts are largely incoherent, rhapsodic, contingent, and do not explain themselves. They are the *primary* or *protocol* data of which we have spoken; for brevity, we designate them by P. Above is the area where the primary data are refined and regularized, where their meaning is stabilized by clear and specific scientific procedures, by measurements. This area of scientific activity is labelled M; in it, the double lines are meant to represent measurement procedures, which link the kernels called protocols (*facts*) with concepts. At the top of the picture *conceptual synthesis* takes place. Here is the domain of ideas, where conjectures are evolved, where concepts are appraised for their suitability to *explain* the world of facts, and combined into laws and principles. We call this field of concepts, C.

This picture of the three domains, P, M and C, does reasonable justice to the structure of science and to the activities of the scientist. But it is misleading in one respect. It suggests that C is above P, that theories are somehow of higher rank than observations. This suggestion is wrong, for in truth the coherence between P, M and C is organic. Sometimes the activity begins with a discovery in P and works through M into C; at other times a fertile idea emerges in C and is finally sanctioned in observations in P. The transaction between the levels is reciprocal.

Pascal, the scientist and philosopher, foreshadowed the distinctions embodied in our diagram. He said, "There are . . . two kinds of minds: one, able to penetrate quickly and



profoundly the consequence of principles . . . the other, able to comprehend a great number of facts without confusing them. . . . The first has a strong and vigorous incisiveness, the other a broad scope." This neatly separates the scientists who work in C from those in P, but ignores the man in M, who must have a little of both qualities. In fact, Pascal goes on to say: "One [type of mind] may exist without the other, because the mind is capable of being *strong and narrow*, but also capable of being *broad and weak*."

Fortunately for the progress of science, these categories overlap: some scientists have strength as well as breadth, and these belong primarily to the M domain.

There is further evidence for the statement that the concept of reality has undergone refinements, resulting in the decay of the old doctrine of materialism.

Matter, according to an ancient well-established distinction, can exist in two forms. It may be continuous, as in the water of the ocean, or discrete, as in the pebbles on a beach. There is a certain incompatibility in these two forms, and for this reason it is natural that science should attempt either to explain visual discrete objects in terms of an invisible continuum or the visible continua in terms of invisible discrete objects. Both endeavors are prominently recorded in the history of science. We are at present involved in the attempt to resolve all matter into atoms or into even more elementary constituents. This attempt was preceded, however, by another which sought to account for discrete forms by reference to a more fundamental continuous medium in which these forms arose as agglomerations, just as vortices and other kinds of structure arise in

air. The principal name for this continuous medium is "ether."

The ether was introduced into science by Faraday in the early 19th century, in order to account for the forces between electrically charged bodies. Faraday thought of it as an extremely tenuous, all-pervasive medium filling all space and capable of transmitting electrical as well as gravitational forces. But nothing was known directly about the actual existence of the ether.

When Maxwell discovered that light was an electromagnetic disturbance, it needed a medium to travel in. This medium could only be Faraday's ether, which came to be known as the "luminiferous ether," because of its light-bearing quality. This second call upon its services led men to believe in its physical existence, and to wonder about its physical properties. For if the ether did exist, it should manifest its presence in other more direct and observable ways. Therefore, physicists launched a search for the measurable properties of the luminiferous ether.

Space prevents a detailed discussion of the various steps that were taken in this search. In brief, it first appeared to have a fantastically high density. Next, it was shown that it could not be a fluid—but if it were a solid it was of strange and monstrous sort which did not sustain a longitudinal wave, as solids should. In 1839 it seemed that this difficulty might be overcome, when a mathematical theory which could explain the non-existence of longitudinal ether waves was advanced by MacCullagh. His suggestion was followed up by Lord Kelvin, England's foremost theorist, who in 1889 succeeded in designing a theoretical ether model which satisfied MacCullagh's claim. This model was so ridiculously unwieldy that the question at once arose whether nature could possibly be as complicated as this theory required. Inquiry into the workings of nature had run into a serious impasse, and it occurred to some physicists that a wholly new attack on the problem of the ether might be needed.

If the ether is a material medium which fills all space, it must be either completely stagnant, or it might be carried along with the heavenly bodies in their travels. The latter possibility having been ruled out, due to a total lack of observations, physicists were left with the supposition that the ether is stationary. It was to test this hypothesis that Michelson and Morley conducted their famous experiments concerning the propagation of light, which in effect rendered the material ether an absurdity. At this point, Einstein proposed that the ether hypothesis be abandoned in toto, offering the theory of relativity which explains the Michelson-Morley experiments and the propagation of light without reference to an ether. Continuous matter had become a useless hypothesis.

There are some parallels between this account and the situation as regards the atom. As we have already seen, the atom, the fundamental building block of matter, was originally conceived as a discrete bit of substance, spherical and compact and impenetrable. Since then, the atom has passed through a stage of dissolution, finally suffering decomposition into elementary particles. These in turn fell under the spell of duality or complementarity, a doctrine which will not permit us to say whether they are particles or waves. Furthermore, it has turned out that they are no longer permanent; they are fleeting episodes in the microcosm. Little is known of their structure. Therefore, atoms do not affirm the question whether everything that exists is material. A proper answer to this question might be: Matter is no longer material.

Thus, when we return to our original and larger question, the meaning of reality, we are forced to acknowledge its ambiguous nature. Obviously the materialistic doctrine has lost its point. We can only say that the ultimate constituents of matter have largely resolved themselves into mathematical singularities haunting space.

The preceding article is a condensed version of the first chapter in **Integrative Principles of Modern Thought,** ***edited by Henry Margenau, (New York, Gordon & Breach, 1972), which, as the Preface states, "grew out of the activities and the experience of the Center for Integrative Education . . . [whose] purposes . . . are identical with the goals of this book." The book may be ordered from 12 Church St., New Rochelle, N.Y. 10805, price, $16.50.***

F. L. KUNZ

*The Reality of the Non-Material**

THE CONSEQUENCES WHEN LIFE AND MAN ARE PUT IN THE NEW CONTEXT OF FIELD PHYSICS

IS IT POSSIBLE TO SELECT from the new knowledge of today one concept which will later be recognized as the central feature in a synthesis of scientific and philosophical thought? To this question an affirmative response may be ventured.

Physics, the most authoritative of the sciences, has demonstrated that the familiar physical world of the senses is not the only realm in nature. On the contrary, it is certain that this world of ephemera in which we live physically is but the foreground to the gravitational and the electromagnetic force field potentials which, though non-material, and thus beyond the direct reach of the senses, provide the stability and consistency for the diversity which we observe.

It is widely assumed that the force fields would remain even if all compound matter were to be dissolved into them as radiation and other wave forms, dispersing the forces concentrated in atoms, molecules, molar particles and greater aggregations of matter. Therefore, the fields may be thought of as being real in a sense that is superior to the physical world, which bemuses and misleads us by its immediacy and familiarity.

In addition to being non-material and therefore supersensible, a force field has certain other characteristics: universality, internal consistency and hence intelligibility, constancy and presumable permanence, causality in relation to the familiar world of sense experience, and finally, continuity. For brevity, a field may be called a continuum and, taken together, all of them may be styled the Continuum, a term employed by Einstein in reference to space-time.

The great transformation of thought which is characterized by force field concepts has only just begun. It may confidently be expected to increase its scope and to gain authority. For there are well-known phenomena which remain unexplained in terms of the fields so far known. Therefore, the determination that there are others is likely. Each such as yet unknown field will doubtless prove to be particularly associated with some one basic characteristic—or a group of such characteristics—of the substance or process that reveals to the observer some of the field's own characteristics. This is true of those now known. The gravitational field is associated with rest mass (or inertial mass) in all its aspects, inertia, momentum, acceleration, etc. Similarly, the electromagnetic field is associated with electrostatic charges, magnetic momenta, electromotive force, at various levels and magnitudes from the electron upward;

* Source Reading prepared for faculty and students of Utica College Senior Seminar.

and the nuclear force field (now coming to be recognized) with the basic properties of nucleons, whatever those properties turn out to be.

The compulsion to accept the existence and to study the characteristics of fields had its most effective beginnings with Newton. Obviously, a sun, its planets, and their satellites are not reacting upon one another by means of material mechanical connections. On the contrary, the moon, the earth, and the sun seem to be free in space. Yet each exercises a force on the others. How can this action at a distance proceed through what appears to be empty space? Newton was obliged to leave that question unanswered, but he had advanced knowledge to the point where it became necessary to agree that the non-material, the supersensible, is in some sense real. In the sequel it turned out that the space of nature is not empty.

The further extension of knowledge of fields may be quite rapid. To go from Newton, who left action at a distance unexplained, to J. C. Maxwell, who calculated and described the uniform characteristics of one field and thus began to afford some concepts that accustomed scientists to think of space not as an emptiness but a fullness, the plenum, took about two hundred years. To get on to Einstein took only another twenty-five or thirty years. Once the conviction is widely disseminated that there are real domains in nature of a non-material character, but sovereign, the further transformation of thought, from sheer physicalism into the larger view, can be expected to quicken.

Today the critical facts and theories are still relatively new. Our society still habituates many of its members to feel certain about that which can be sensed. This habit arises from physical necessity. After all, we are obliged to live together, and the senses reveal much the same world to all of us. Variations such as color-blindness may handicap the individual, but on the whole a society can be managed physically along so-called practical lines.

Up to recent times, science itself has tended to strengthen the conviction that the sensed world is the real one, and its technological successes have given it prestige. Up to recently, therefore, the existence of anything else—a non-material reality in contrast with the familiar, physical, material world—was only feebly supported by inherited beliefs.

This state of affairs has now been radically challenged by science itself. But still considerable effort is called for if the individual is to reorganize his thought. The new view obtains at present only in physics and chemistry. To acquire the concepts and then to transfer them as knowledge (not as beliefs) into other areas of experience calls for conceptual ability.

As of today, many obstacles additional to language stand in the way. In biology and human psychology, appropriate fields are not as yet documented. We live in an age habituated to one state of mind in thinking of matter and energy, some other state of mind for life and its functional forms, possibly a third for man, his works and his societies. Or, discontented with this pluralism, we may attempt to reduce life and man to physical matter and to familiar forms of energy, explaining away or ignoring inconvenient but incontestible phenomena. The thinking that the sensed world is real and that anything else is unreal has become a habit. We say, "seeing is believing." It is common to think this means seeing is knowing. But of course to know what other people know by having the same sense experience does not mean that all—or even that anyone—can understand what has been sensed in common.

Force field potentials are not seen. Nevertheless they are known to exist and, what is more, they are understood and their characteristics have been described in precise detail. This is a very remarkable state of affairs. Everyone is compelled to accept the existence—and anyone may, if he cares to do so, understand the characteristics—of these domains in nature which no one can directly experience in the ordinary way through the senses. The determination of them is achieved by reason applied to the things, creatures and processes that can be observed. In consequence the tendency has lingered overlong among us to think of the fields as mere intellectual constructs, not realities in nature. This is challenged by the evidence. The fact is that in many practical affairs supreme reliance is put upon the field. An astronaut, for example, may have reason to doubt the reliability of the capsule and everything in it, including himself, but he is entitled to feel utterly certain that the gravitational and the electromagnetic fields will be available at all times and at any place whatsoever.

In radical contrast with force fields, matter is known through the senses with immediacy. In many other ways also the sensed world stands in direct contrast with the fields. A thing or a creature is localized. If natural, it will embody universal principles, but is not itself everywhere. Things and creatures are diversified, and a long search, not always fruitful, may be necessary before the local and particular object is seen to be a consistent fact of an intelligible universal. Even then perhaps it only becomes a particular in a human intellectual classification, not a representative of universals that are recognized as actually existing in nature. An object is also ephemeral and in incessant internal motion. As the years go by, more and more we are obliged to think of things as localizations of fields. An atom, for example, may be correctly thought of as a standing wave system in an open wave force field potential. Matter in truth does not exist in the old sense of something that occupies space.

The interrelation of the field and appropriate objects is established at the microcosmic level, such as that of the atom. Since molecules, molar particles and great aggregates of substances are made up of atoms, the field is everywhere present in the object.

An object without a field is today difficult to conceive scientifically. But a field without an object in it is imaginable, even if unrealizable.

In physics the new state of mind rests upon experiment and theory so diversified and authoritative as to ensure that it is here to stay and to lead on to further developments.

The charactertistics of the foreground, sensed things, creatures and processes, in contrast with those of the background, may be tabulated as follows:

The fields display:	*In contrast things and creatures are:*
Universality	Localized
Internal consistency and hence intelligibility	Diversified
Virtual infinitude, actual vastness	Finite
Causality	Derivative
Durability	Ephemeral, i.e., transient
and are Supersensible	Sensed

In respect to nineteenth century convictions the new state of mind is revolutionary. Its dissemination and proper dominance are delayed by various impediments. A great variety and wide range of facts must be acquired and their theoretical unity seen before conviction is achieved. Much of the documentation is still expressed in technical terms, and new technical items are coming forward constantly. This is one of the reasons why science now appears to contradict common sense. It has, of course, gone beyond common experience; and some philosophers of science believe that some of the current theory does seem to lead to denials of common sense, e.g., the probability that the water will freeze when the kettle is put on the fire. One may, however, be confident that they themselves continue to put the kettle on. An inquiry into their conduct is clearly in order.

The emergence of field physics has created in modern times a scientific metaphysics. That is to say, there exists a state of affairs other than physical nature. The Greek term ωετα (beyond) μνσις (nature) is usually associated with Aristotle, who wrote a book on nature (μνσις) and another which followed, hence was beyond. The term has also a general meaning. Metaphysics has hitherto been largely speculative. That there is a state of affairs beyond sensed physical nature can no longer be doubted. That non-material state is, of course, not unnatural. It is nature in an aspect concealed from the senses and revealed (in part) by the nature that is directly observed. We see, therefore, that the new physics raises some very ancient questions. It does so by extending our knowledge of nature, not by the introduction of lawlessness.

Since matter, in the old sense of something that occupies space, does not exist, it follows that the universe is no longer to be looked upon as a vast, disordered collection of isolated nebulae, stars, and planets scattered about in empty space. Anyone who cares to do so can determine for himself that the precise opposite is the truth. We are now obliged by the evidence to realize that at any and every point, throughout the entire universe, there are force potentials. Far from being a meaningless emptiness, dotted with discrete and lonely material systems, what formerly was called space turns out to be a presence. We may, indeed, speak of *the* presence. For surely there is but one continuous, intelligible, invisible, inviolate, potential that is revealed to the senses by the presence of that diaphanous fabric formerly called matter.

Einstein could not think of a suitable experiment by which to test his unified field theory. But this temporary difficulty does not alter the fact that each field potential is at all times present at every point, inside and around every atom, thing, creature and process. In fact, in studying the fields we are studying that which in truth integrates the physical universe. It follows therefore that we are studying that which integrates knowledge. For it will surely be agreed that valid knowledge goes on inside the universe. Since the unity provided by the fields is of a non-material variety, and since knowledge itself (not brain matter) is also non-material—being concepts, not printers' ink—the present inquiry is, by its very nature, integrative. Besides the unity, universality, intellegibility, sovereignty and continuity of reality studied directly from the evidence, it will be desirable, at the proper point, to examine also the human knowing process itself, i.e., epistemology. But we do not need to wait on that topic. It is possible to head straight into such questions as these: What are force fields? What are field potentials? How can they have localizations called atoms? In what way does the field function to aggregate atoms into visible things? We shall be proceeding from the known and knowable *one* to the apparent *many*, without abandoning the kind of unity which is called universality.

II

In the new context provided by physics it becomes simple to make a beginning on the scientific answers to the question: What is an individual human being?

The response starts, as all science must, with careful and conscious observation of nature, in this case of human nature. It is self-evident to us all individually that an adult is a consciousness capable of self-examination, of self-knowledge. Anyone who denies this will find himself examining himself in the very act of making a denial, if his response is reasoned and not instinctive. In addition, the conscious observer is capable of studying that observable self as an object in the rest of objective nature, an environment.

It is also equally obvious that that part of the self thus available to the consciousness for direct examination (in-

trospection) is a very small part of the whole of the personality. That which eludes such direct inspection (the unconscious) includes all of the internal organs and most of the workings of the body (which may make their fatigue or discomfort known as psychological events, but are not themselves visible) and much of the mind, the emotions, the vital tone and whatever other features of the psyche may be named. Most remarkable of all is the demonstrable fact that the conscious man can examine his own concepts, the meanings he formulates or which take their own shapes within him. He can even, by reflection and effort, change them at will, although when he is observing an external scene he feels he must extract its own meaning from it and, if the meaning is clear, it commands him. If it is indifferent or wholly uncertain, he feels impelled to supply meaning. Man, in short, is made to know, and if he is in circumstances he cannot understand he will invent explanations or believe those he has inherited. I am saying that beside the psyche (so like that of higher animals) there is a conceptual drive that is observable by conscious effort, commonly called will.

In healthy waking states the consciousness and the conceptualizing are inseparable. Nevertheless there is a priority: consciousness can examine concepts, so the latter are objective relative to the former. The centralmost questions in psychology are thus posed by plain observation: What is this conceptual-cognitive complex? What is each of the components? How are they interrelated? What is the ground in which they operate?

The individual is also a conscience, because he is impelled and compelled to act upon his knowledge. He has to choose among courses of action open before him. The conscientious act is one made with knowledge and care and —if there is time for it—even reflection. It may be regarded as the cognitive-conceptual complex in the affective in contrast with the intellective modality. As things stand with mankind today the choice is incessant. In the geniuses of the race the moods are not antithetic. The core of our being is one and the same. If there were no consciousness of an objective self and of that self as an object in the world, but only natural intelligence (an immediacy, as we see in animals) there would be no impersonal choices to make, no unselfishness to exercise, no conscience after the act but, instead, much before it.

So much for the initial stage of scientific inquiry into one's own nature. Its importance and general features are supported by experiments in gestalt and other schools of psychology.

Our purpose here is to remark that now that the reality of the non-material—as the universal, the continuous, the base-causal source of visible nature—has been established it is no longer necessary to hold that a conceptual-cognitive complex is merely material, or even that it is only local, although it may seem so on first inspection. Although it appears to us that our concepts are our own (and most of them may be such a compound of what is real and what is incorrect as to be peculiar to us), when they are valid as regards nature as we demonstrate nature to be, they are in fact universals and some of them (in geometry, for example) are indeed isotropic with nature. Is there universality in which consciousness itself, the very root of our being, indispensible for man, is a localization? Are we, in truth, isolated from our source by reason of our imprisonment in the ephemeral organism? Will it not be an exercise in total integration if we can show by reason that the poets, the mystics, the best of the theologians and idealistic philosophers have been right, all along, and that science is metaphysics?

III

I now propose to direct thought to man, in this new context. In hope of being clear, I shall not hesitate to repeat in summary form what has gone before.

In brief, it is now necessary to restudy all knowledge. Present data will look very different after we have habituated our minds to the fact that the force field potentials (noumena) are the reality; that atoms are standing-wave systems in localized active fields; that when aggregated into molecules and molar masses, the atoms make possible the illusion experienced as the sensed (phenomenal) universe, which has so long and so mistakenly been thought of as the reality. There is an important element of truth in this error: after all it is study of the behavior of the things which constitute the objective world that leads to knowledge of reality. Natural things and processes are finite, partial, but revealing representations of the universe. They are not misleading. We have misled ourselves. The time will come when a new state of mind will be commonplace in the philosophy of education. Meantime, resolute independent effort, and close and sustained study, will be required if an individual desires to free himself from the inherited attitude.

He will come to see that there is one universe. It consists of several force field potentials which constitute not empty but full space, the plenum. At present three are recognized. The existence of others is quite certain to be established. We may think of each potential as providing and characterizing the fundamental properties of the test matter which reveals it. Thus mass and the behavior of masses enable us to assign certain features to the gravitational field, for example.

Each such potential is present at every point in space, and together they constitute the Continuum. A natural thing or process is a localization thereof. Since the force field potentials *are* the real space of nature, and are nonmaterial, they can be and are present at every point, and therefore every natural thing or process occurs in all of them. But not all of them are revealed by every object, only by appropriate test objects. For example, any matter with rest (or inertial) mass reveals the presence of the gravitational field and iron does so also; but it can, in ad-

dition, reveal the presence of the magnetic field. Photons are features of the quantized radiation field, and so on.

A matter-and-energy system induces localization of the potentials, and thus fields with changing states come into being. In speaking of force field, therefore, one is necessarily thinking of the associated things and processes as well. It has, however, now become possible and necessary to explain the universe in its primary field terms.

To us the nature and behavior of things seems naively to be the causal element. This attitude is erroneous. Nothing can exist or happen except that which the fields, by their proper nature, allow. When a mathematical physicist thinks of the universe (in contrast with thought of some local event, of which, say, mechanics is the immediate explanation) he bears in mind that the field potentials are everywhere and at all time available, that they may be (and necessarily are, if he is to study them) localized in one of a number of stationary states, the most stable (the ground state) being that of lowest energy. He knows that fields may interact and exchange energy; that between two of them there may be bound states (studied in chemistry as the bonds between atoms), and so on. That is how he thinks, and he acts accordingly in experimenting. It is necessary for us all to begin to think in that same manner, i.e., in terms of universals—a universe—localized, not of a universe that consists of sensed objects as if they are collectively the whole. The whole *is*, in its own right, and it is non-material (but real), continuous, characterizable. *Au fond*, it determines what things can and cannot be. The physicist does not make or break laws, he finds them out, and obeys, and *thus* uses them. They are, fundamentally, the laws of the non-material continuum.

So much for matter-and-energy systems. What of life and man?

IV

As noted above, it is a natural tendency in physics and even chemistry to reduce all phenomena to the terms of those sciences, and even to try to limit explanations to that which is currently known in them; and biologists and psychologists may meekly fall in, so powerful and respected are the deductive aspects of the sciences of matter and energy. But there are processes in nature such as protoplasm —as cytoplasm, even more so in nucleate, cellular and particularly germ-cell form—which are inexplicable when theory is thus restricted.

What is needed now is a systematic exploration which will re-interpret life and man, using the same basic means as have been successful with matter and energy. This requires the rejection of reductionism, that is to say, the tendency to leave unexplained that which calls for the recognition of new force fields. For reductionism is only achieved by theorizing as if living creatures are not alive and as if human beings are not conscious. There is one universe, and modern understanding requires that all experience and knowledge be seen as a consistent part of the whole. Unity is possible because the reality is non-material and continuous and therefore universally present. That reality is the ultimate *environment*.

The old situation is as follows: in that part of biology called ecology, creatures and their material surroundings have long been studied as one whole. The interdependence of soil, water and air and of all the plant and animal life in a region is intricate, but well ordered. Each species has its niche. The creature seems to depend upon the physical environment, having only limited adaptability to a radically new one. Therefore, in the causal relation, the nonliving material environment seems to be the dominant component, although it is obvious that the living orders are superior in many ways.

The basic truth is today seen quite differently. The seas and lakes, the mountains and snows and streams, the atmosphere and its clouds, are themselves docile creatures of the true environment, the force field continua; and it is known that living creatures also trade skillfully and directly with this true environment.

For example, plants live in and exchange with the electromagnetic field. The plant has measurable polarities and gradients that vary with the season, the month, the week. H. S. Burr, of Yale, has read the phases of the moon from his electrical recordings of the life activities of maple trees. The photoelectric effect described in Einstein's equation is at work as photons strike the choroplasts of green leaves. The philosophical importance of all this is very great indeed. It demonstrates in the life orders relationship of finite things and creatures with the non-material universals, which cannot be known through the senses, directly, but are well established by knowledge. All creatures, including humans, are incessantly adjusting not only to mechanical and chemical changes but also to electromagnetic field forces and to others, no doubt, as yet unknown.

At present (as noted above) the interrelations of plants and animals with force fields are interpreted in terms of physics and chemistry, necessarily: the only force fields known are those in which matter-and-energy systems are the test objects. The day will surely come when a life-force field will be established. Naturally this can hardly be expected so long as biologists are content to subordinate the unique data of their department of science to the theories of other departments, as today is so commonly the case. Despite this state of affairs, even today we know that every living creature is operating in and with some and probably all of the force field potentials. After all, everything is made of atoms. So the fields are the true environment, common to both the living and non-living.

V

Are the force fields the ultimate real? Here we must be very careful. For besides the force-and-energy components of any aspect of nature there are also the characteristics of the

wholly ideal features to be recognized as basic environment. For example, the planet's creatures live (and its crystals and other constructs are formed), and we ourselves and our societies operate, in a three-dimensional space, a given geometry of nature, which has innate, self-existent and self-consistent properties that we cannot alter. The mere passive presence of three-dimensionality imposes restrictions—and, of course, also facilitates—so that what can and cannot be done by force and energy (in nature or in man) in this space of common sense experience is determined. By knowing and obeying the inviolate properties (and the consistent derivatives) of our life-space, we take advantage of them, maneuvering within them. It is just because they are unalterable that they are so valuable. Events in this world would come to sorry confusion if suddenly it became possible to put a fourth straight line at right angle to each of three others, through a common point!

Einstein has actually led us to think about the reality and properties of a four-dimensional domain, space-time, in and in accord with which the forms and activities of things in motion are determined. The mathematicians speak of it as quasi-real, for the time component has a negative sign: $x^2 + y^2 + z^2 - T^2$. A space-time appropriate to the motions (i.e., time) peculiar to life would need to account for development, evolution, recapitulation, metamorphosis, symmetry and so on. As yet no one has proposed such a hyper-dimensional realm. For it the time component might turn out to be positive. Cyclism in living nature is nearly, if not quite, universal, and there must be reality behind it.

The forms and relations of living and non-living visible nature are determined, then, by the given geometry of the physical universe, whatever that may ultimately prove to be. Thus a field is really a compound of its energy-potential characteristics, *and of the metric*. It is not easy for any except geniuses like Einstein to be at ease with the fact that by their mere passive being the ideations (or geometries) of nature may have a sovereignty superior to the most powerful of the energy-matter systems. Yet this may be the truth.

VI

So the situation is this: there is a non-material universe. *That is the true environment*. Therefore we are impelled to re-study the material environment and the living orders as phenomena going on in a common supersensible nexus.

What of man? He is unique in two important particulars. First, if the infant is to develop to maturity, a special environment is required, namely, a human society. Many animals are viable in their usual habitat the moment they are born. Not so we. For us it is not merely a matter of being nursed or attended. These physical necessities are but the beginning. There is a potential of mind and morals in each individual, a force even superior in some ways to that of life, and so essential to a man that if it is not called forth by human association he does not become human. The environment, for this purpose, must be the right kind—not just any kind—of human society.[1]

Second (I repeat), a human being is capable of self-examination. Any one who is beautiful or bold can stand before a mirror, and study herself (in the one case) or himself (in the other), quite impersonally. (A pronoun free of gender has long been required, such as, it might be, *heesh*.) *Heesh* can examine not only *hersh* physical appearance, but even emotions and thoughts, determine a new course, recall the past, imagine and plan the future. (This advance by man beyond life is as basic as was the advance beyond matter which occurred with the appearance of protoplasm. Our failure to admit this has been the beginning of much error in psychology, now being corrected by a very few new forces in that field of study.) Therefore a human is, really, a cognitive-conceptualizing, moral-aesthetic localized force dwelling in an individual environment that we call a personality, a body-and-psyche complex that in most respects may be like that of the higher (and especially the domestic) animals, but with the wondrous difference: there is an Indweller, the real Man.

The behaviorists talk about anger, fear, disgust, sorrow, joy and the like, admitting that the cognitive-conceptual man is aware of such changes of state in the field of his psyche. They trace these to some kinds of basic, adaptive, biological processes, of which adrenalin, etc., are the physical by-products, and they connect them with the environment as incorporation or acceptance of stimuli, rejection or getting rid of something harmful, and so on. What is not properly investigated is the nature and status of the Indweller, the cognitive-conceptual-moral root of being, without which the human race would soon cease to be.

VII

This brings us face to face with major deficiencies in our knowledge. To begin with, the appropriate force fields required to explain life have not yet been established. Studies of the ideal metrics or geometric systems of the life orders have been made, notably D'Arcy W. Thompson's classical work, *On Growth and Form*; and a total mathematical treatment of all of morphology and morphogenesis has been promised,[2] but all this is at present the interest of a few specialists. We all realize that the adult human physical organism does result from the development of an ovum, and that in fact a sketch of the whole of millions of years of evolution is epitomized in nine months; phylogeny recapitulates ontogeny. How is that astonishing business managed by nature? In due course all this may be described in terms of appropriate force fields and metrics.

[1] No cases are quite certainly known of children growing up from infancy among animals, a state called feral man. But the diary of a missionary in North India, the head of a Sikh family by the name of Singh, gave an account, a few years ago, of two young girls found running on all fours with a wolf pack. They were animals, and the endeavor to place them in a human society ended in their deaths.

[2] By G. D. Wasserman, Professor of Mathematics, University of Durham.

But even when that has been done for man, as an animal, we shall still have to answer this question: Do we, as cognitive, reflective, moral beings, inhere in some kind of ultimate reality which endows the child with a potential that in our imperfect societies is denied fulfillment?

The tragedy of the human circumstance is first that the individual is shaped culturally in a very limited social milieu, when he is young and relatively helpless; and, second, that the educational system is as yet unable to employ a consensus upon the true potential of a human being, or even to suggest how the adult individual is to go about the process of self-realization after education has shaped him in ignorance thereof. In fact, one or two conspicuous groups in the educational world do not believe there is such a thing as a human cultural potential, a meaningful existence for man, a purpose for him in evolution. Such a state of mind would be tolerable if the physical world were the only reality. Since, however, it is quite certain that the non-material is real, physicalism and animal-training educationism are serious inadequacies, quite misleading.

Fortunately, from almost the very beginning, the child asserts his true potential. He insists on knowing and loves to learn, when right opportunities offer. This has been dramatically demonstrated afresh recently in this country. A method awakening *algebraic* thinking in school children aged five or six was introduced five years ago (from Belgium, via England). The eager delight of young American children in exercising their conceptual resources in mathematics can now be observed in thousands of schools. Piaget and others have shown that children from five to seven years are richly endowed with conceptual power. All that needs to be done is to put them into situations which embody realism, in this case algebraic in character. The potential is then called out. (Plato describes this state of affairs in his *Meno*.)

That there is a potential is acknowledged, albeit only in a practical way, by the attitude of enlightened people who adopt Korean orphans; and do we not all look pityingly upon the poor Papuans? We may even feel sure that if one of their new-born infants were brought up lovingly in "a good American home"— complete with radio, television, three cars, and an adequate supply of bubble gum—the resulting adult would be marvellously different. I incline to agree, but the logic of this state of mind should be pursued. Unless we are convinced that our society is the last word for all time, the ultimate optimum for human growth, we are called upon to begin the research implied in these remarks, the goal being the disclosure of the reality of which cultural-cognitive man is a localized moral potential.

Meantime we are not helpless. For the potential has been asserting itself to some extent in inadequate societies ever since man appeared on the scene; and now and then some rare genius embodies it inspiringly. Struggles for freedom, for truth, for justice, for beauty, for insight, never cease, and we are getting there slowly. What is now proposed to us, if we pursue the implications of the new knowledge is this: Whatever a finite cultural human being actually can and should be may be supposed to be present as universals, here and now. That is to say, just as an atom is a localization of the universe, so the psychologists (if they desire to use the gains of field physics) should begin to look upon conscious, cognitive, cultural, moral man as a localized force of which the physical organism is the test object, the material-seeming process in the sensed world.

Only very perceptive and courageous psychologists are likely to investigate the data which suggest that there are force potentials of a kind cultural man can and does express. For the failure to articulate a field theory for biology holds us up. When the study of animal-physical man as a localization in a known force potential has been well enough advanced, as part of a general transformation of biological theory, then it will be possible to inquire seriously into the relations to nature—material and non-material—of the cognitive-creative, moral, characteristically human features of the race.

The required research must start with protoplasm. It displays characteristics that go beyond those provided by the laws of physics. The mystery is already great in a primitive life-system such, for example, as multi-nucleate noncellular slime-mold. It grows far more remarkable in the germ cell, in specialized tissues, in organs, in the whole of a compound organized form. We read that the heart beat of a chick begins before the heart develops. We would all be astonished if electromotive force came along the wires before a dynamo has been installed in the system. With what is the *anlage* of the chick's heart-to-be in communication that it beats before the organ itself appears? There is every reason to look for a field or fields in which a life-force, in contrast with the gravitational, electromagnetic or nuclear force, is the potential. Naturally, as the atomic nucleus functions in those three fields simultaneously (gravitation, electromagnetism and nuclear) so also a living creature is to be thought of as operating simultaneously in more than one force field potential. At present, efforts are made to reduce the characteristics of life to known systems, such (for example) as those of electrodynamics. (See *Main Currents*, Vol. 19, No. 1)

When biological field theory has been established for the living orders and processes, as they are, and not as they are when reduced to physics and chemistry, it may be possible to investigate cultural man as a test object in a value-charged field. Since we cannot speak a word without implying a concept, why should we not expect to find that there is a force in mere meaning? Does not truth have a life and power through the ages? Why should we not think of ourselves as localizations thereof, not merely of bodies and psyches in the life-force field, but as conceptual and creative concentrates in the ultimate self-existent? This is precisely the implication of the best of Greek thought and the exact conclusion of classical Indian science, mathematics, and metaphysics.

By way of postscript it may be well to notice the basic means by which the physicists have transformed modern thought. The instrument is, of course, mathematics, the language which allows us to describe absolutes. Two plus two is four, not approximately but with finality. The moment we speak of (say) two plus two inches we are no longer speaking the language of mathematics as a deductive science, but about measurement of and by things physical. Since nothing material is ever perfect, but always approximate and relative, it follows that if one is to use mathematics (as a deductively based science) he must be alert to the difference between the pure and applied forms.

Pure mathematics is required to deal with the non-material, per se, and applied mathematics is used when material things, creatures and processes are to be measured and their mathematical characteristics are to be calculated. So long as the forces in the phenomena are (or can be treated as if they are) of a mechanical character—pneumatics, impact from momentum, etc.—the role of pure mathematics is limited. Its deductively-based authority is present in the calculations and provides reliable reasoning. But when investigation in hand has to do not with mechanical but with action-at-a-distance forces, it becomes necessary—and latterly has become possible—to start with postulates and to proceed with pure mathematics up to the point where the nature of the particles has been determined by theory. After that measurement enters in, if there is to be empirical proof. Theory may, in some case, (in crystallography, for example) lead to results more exact than can be made by measurement. It is said that when, to test relativity, the first measurements were made of the apparent shift of the position of stars during an eclipse of the sun, they did not justify Einstein's predicted quantities. It is rumored that he was so confident of his figures that when the discrepancy was reported he remarked that they should take better measurements.

Readers who may desire to reflect upon the manner in which mathematical biologists would proceed to establish the existence and characteristics of a life force field potential might, with advantage, read a paper in *Extrasensory Perception,* a report of the Ciba Foundation Symposium held in London, May 3-5, 1955, presented by Professor G. D. Wasserman, University of Durham, entitled, "An Outline of a Field Theory of Organismic Form and Behavior." The non-mathematical reader may be aided by bearing in mind that the calculations of the properties of the force fields now known involves types of force recognized in gravitational, electromagnetic and possibly nuclear phenomena; and that these types, though present in physical life processes, do not suffice to account for them.

In this kind of program, the investigator starts with postulated universals, and proceeds by means of pure mathematical structuring until he arrives at finite results, just as one may start off with rectangularity and end up with cubes, in a static system. The mathematical physicist or biologist, however, is dealing with kinetics and eventually dynamics. He must, at some stage, include force quantities. In the case of physics, this was the contribution made by Max Planck's genius and labor, for which he was awarded the Nobel Prize in 1918. What Planck determined was not a thing, but an event: a little energy for a little while. Radiations are waves, but they are emitted from the standing wave systems which we call atoms in specific jumps (so to speak) the magnitude being determined by the frequency of the wave multiplied by the small constant, h. Thus the investigator moves from the open system of the field to the particulate basis without which a sensed world is impossible.

At present life processes are referred to electrodynamic forces. The question is, however: Is there a life force which enters the physical scene at some stage and leads to the appearance of the long chain molecules characteristic of the life processes? It is a familiar fact that in the living cell there appears a line element, between the polar bodies. This provides a point of departure toward the linear-spiral symmetries of the long chain molecules. All this calls for a very different approach in biology, the use of field techniques in the study of living orders.

It is not easy to enlarge our thinking, or to feel comfortable outside our snug, familiar, sensed world. It comes as a shock to realize that infinity must be used if we are to understand the world of finites, as in chemistry, where infinite dilution may lead to accurate results not otherwise obtainable. Obviously, infinite dilution cannot be obtained without an infinite quantity of the dilutant, and infinite time in which to add it, both tolerably difficult to achieve. Fortunately, however, infinity can be defined mathematically according to need, although it still remains the least well understood quantity.

So challenging is the new science that some scientists, busily working in their own specialties, are content with the matters in hand, thinking of the universals as mere calculations, notions, or energy exchanges in the cortex of the brain. The difficulty in refuting this position lies in the fact that, in a sense, they are right. Brains are, indeed, localizations of universals. Everything is here and now present; one does not travel to find the Tao, as Lao-tze has said. But for education and for a good society, insularity won't do. We may think of a visit to the Moon or Mars as just another expensive chore, calling for special hardware. But shall we then understand either the Martians, or ourselves?

Freedom is really important. It is not a juridic creation, or a by-product of affluence. It is a function of laws in nature, a possibility in a universe that is polydimensional, ideal, a self-ordered reality. Indeed the United States was started on its way by a declaration which speaks of the Laws of Nature. It also refers to Nature's God. If God is limitless love, and exalting beauty, as well as absolute truth, then the possessive form, "Nature's God," is to be taken in the proper sense. For love and beauty are not chaos. They are the fulfillment, not the violation of Law.

DONALD HATCH ANDREWS

The New Dimensions of Nature and Man

THE SPACE-TIME BOUNDARIES OF HUMAN EXISTENCE

DOWN THROUGH THE CENTURIES from the very beginnings of human thought, there has been a continuing search for the answer to the question: "What are the dimensions of man?" Sometimes the question is confronted explicitly as in Reinhold Niebuhr's great essay on *The Nature and Destiny of Man.* He says, "Man's dimensions include both time and eternity. But eternity is neither infinite time nor undifferentiated unity." Frequently, the question is present implicity, as in the legend of Petrouchka, the Russian Pierrot. In one version, Petrouchka is a puppet of human size, made from clothes stuffed with sawdust and displayed in a sideshow at country carnivals by a showman who is a magician and who has mysteriously endowed the puppet with a kind of life. Petrouchka has two companions, similarly made and also magically alive, a ballerina and a blackamoor, and as they go from carnival to carnival, the sparks of life in the puppets kindle, and they acquire human emotions. Thus both Petrouchka and the blackamoor fall in love with the ballerina, who flirts with each but finally repulses Petrouchka and embraces his rival. Brooding over this, Petrouchka suddenly, in the midst of the show, attacks his rival, but the blackamoor seizes his scimitar, chases Petrouchka off the stage into the marketplace, and slays him. When the spectators are startled at the realism of the fight, the showman displays the sawdust limbs, so that they are reassured and leave laughing. Then, as darkness follows and the snow begins to fall, the showman trudges off trailing the limp puppet, but he is suddenly frozen with terror as the ghost of Petrouchka appears against the sky, embodied in an unearthly light, violent and threatening.

In our own time, this legend has had a remarkable revival in a ballet produced by Diaghilev, with music by Igor Stravinsky, one of the series created by these collaborators which produced such a revitalizing effect on the ballet theater in the early part of this century. Nijinsky was the first interpreter of the role of Petrouchka, and it is said that those who saw him felt a peculiar fusion of his life into the role. For it was his last and perhaps his greatest interpretation, and he departed from it to enter a mental hospital for a long confinement, which ended in death.

In many ways, the most moving scene in this ballet is in the second act, where the puppet Petrouchka is found imprisoned alone inside the walls of the great packing case in which he is carried from city to city. As the curtain rises, the music suggests his longing for freedom and the turmoil of his emotions height-

ened by confinement, while the gigantic image of his creator and captor, the magician, glares down at him mockingly from the back wall of the box. In a frenzy, Petrouchka dashes back and forth, banging his head and his whole body against these walls. We sense that Petrouchka is humanity. Is man, then, nothing but a puppet dancing to the mocking tune of a magician? As the twentieth century physicist might put it, is man nothing but a particle in a box? *Or*, as Niebuhr expresses it, do man's dimensions extend beyond the boundary walls of the finite to include both time and eternity? And can we somehow achieve a sense of that eternity while confined here in time? Can we transcend out finitude?

It is in this perspective that reflections on Petrouchka's box and the particle in the box of the modern physicist open new vistas. For our views on the fundamental particles of nature have undergone profound changes within the last three decades; and since we, along with the rest of the universe, are made of these particles, these new discoveries change the perspective in which we must view ourselves. Forty years ago, the fundamental building blocks of the universe, the electron, the proton and the heavier atomic nuclei, appeared to be *particles of matter;* they obeyed the laws of mechanics; their aggregates constituted machines. This led many scientists and philosophers to conclude that human beings are merely machines and that the universe is a vast supermachine, gears interlocked with gears, grinding on in inexorable determination from an initial to a final infinity of time. But because of a series of startling new concepts, stemming from a suggestion by the French physicist, Louis de Broglie, about 1925, and confirmed in a variety of ways experimentally, it now appears that the behavior of these fundamental entities is characterized less by a particle-like and more by a wave-like nature; and it is the harmonic relations of these waves which determine the aspect and action of all that the universe contains. In a word, both the universe as a whole and we in particular are not matter but music; so here we have a new perspective in which we see something very different from deterministic behavior. Here, there begins to emerge evidence for new dimensions of man. From the spectroscope and the telescope, from deflection and refraction, we are obtaining signs and portents compelling us to reorient our sights nearer to the directions scanned by saints and seers in the many centuries past.

Now you may be disturbed that we are seeing these new vistas through the eyes of instruments rather than through inner vision. But as Alfred North Whitehead remarked, the doubt implied in the question, "Canst thou by searching find out God?" is good Hebrew but bad Greek. On the one hand, it can be argued that Satan fell because of an indecent desire to understand his Creator, and there may be some who feel that Satan was the first scientist and suspect that today's physicists, chemists and biologists are his offspring. They say that what appears to be scientific proof today may be close to falsehood tomorrow and that to erect a temple of faith on these shifting sands is worse than folly. I agree with them completely that evidence from the laboratory should not be the primary basis of faith. On the other hand, it cannot be denied that today when science speaks, many listen. Rightly or wrongly, because of its impressive material accomplishments, science has acquired great authority especially in the minds of the younger generation. For this reason, I believe that it is important to try to see as clearly and completely as we can the deeper implications in this new perspective which results from the changing interpretation of the nature of the fundamental entities of the universe and the way in which they interact.

The Atom As Machine

To bring out more vividly the nature of this change, I would like to review briefly the concept of the atom as a machine and then compare this with the new concept of the atom as music. Inevitably, when we speak of atoms, we deal with small dimensions and large numbers. The atom is almost inconceivably small and the number of atoms even in the human body is almost unimaginably large. In order to get some feeling for these large numbers, I once calculated the volume occupied by octillion peas, there being about octillion atoms in the human body. First, I counted out a hundred peas and found that they occupied a volume of about one cubic inch. Thus, a million peas would fill a household refrigerator, a billion peas would fill a whole house, a trillion peas would fill the houses in a medium-sized town, and a quadrillion peas would fill all the buildings in the city of Boston. Since buildings quickly become inadequate as we go up the scale adding three ciphers at a time, I decided to take the state of Pennsylvania as my measure. Imagine a blizzard over Pennsylvania, but instead of snowing snow it snows peas. We get a blanket of peas, four feet deep, covering Pennsylvania, all the way from the Maryland line up to New York state and from New Jersey out to Ohio. With the state thus covered, we will have approximately quintillion peas. The blizzard then rages over all the land areas of the globe and when we have North America, South America, Europe, Asia and Africa covered with peas four feet deep, we have sextillion. Next, we freeze over the oceans, cover the entire surface of the globe with our blanket of peas, go out into the Milky Way, get 250 other planets about the size of the earth and cover those also, and then we have septillion. Finally, we go out into the farthest reaches of the galaxy, assemble 250,000 planets, each the size of the earth, cover all these with peas four feet deep, and then, at last, we have octillion peas equal in number to the aggregate of atoms in an average human body. Thus, we can grasp a little of the smallness of the atom and the enormity of our own complexity.

We now wish to look inside one of these small atoms. Suppose we pick for our specimen an atom of calcium in the tip of the bone of your fore-finger. Imagine that you can take an Alice-in-Wonderland growing pill and enlarge your body by a factor of a trillion, at the same time en-

larging this atom of calcium. You will attain a length of over 100 million miles, the order of the radius of the earth's orbit around the sun, and this atom of calcium will grow to a great ball about 100 yards across, big enough to put a football field inside.

If we step inside this enlarged atom and put on magic glasses which give us the older *particle* view of things, we will see circulating over our heads, down at the sides and under our feet, some twenty balls, perhaps roughly the size of footballs. These are the electrons, the particles of negative electricity which circulate like planets around the sun and by their motions create the forces which bind this atom to its neighbors, thus making up the solid structure of the fingerbone. We look down at the center to see if there is an atomic sun holding these planetary electrons in their courses and there, with the atom 100 yards across, we see a tiny whirling point the size of a small marble. This is the atomic nucleus, the speck which contains almost the entire mass of the atom and its charge of positive electricity. We ask what else there is and the answer is nothing, nothing but empty space. And since we are made of atoms we are nothing much but empty space, too. If by some magic a superman could take your body in his hands and squeeze these atomic holes out of you the way you squeeze the holes out of a sponge, you would get smaller and smaller until finally, when the last hole was gone, you would be about the size of the smallest speck of dust which you could see resting on this piece of paper. This is a measure of how insubstantial you are.

It was essentially this picture of atoms as whirling particles which fortified many of the arguments for a mechanistic universe. In almost every way, internally and externally, the atom appeared to obey the laws of mechanics. The failure of its moving electrons continuously to emit radiation was puzzling; but it was pretty much agreed that nevertheless cause generated effect and effect followed cause in an inexorable chain. We, as well as the entire universe, appeared to be nothing but gears grinding in gears. As Lucretius put it: one breath of lavish creation, then one iron law of change; this is the true echo of the life of matter. Moreover, this life of matter appeared to embody other laws which boxed in the possibilities for the universe. The law of conservation of matter asserted that matter could neither be created or destroyed. A similar law of conservation asserted that the same relation applied to energy, the dynamic factor which makes the world go around. True, the theory of relativity showed the possibility of changing matter into energy or vice versa, and this gave us one box instead of two, but we were still left inside the box. Finally, the second law of thermodynamics asserted that this energy was tending more and more toward uniform distribution over all possibilities and that, consequently, the universe was running down. As Norbert Weiner expressed it, the universe tends toward democracy, and when it has achieved that state it will be incapable of doing anything more.

As we look back with hindsight on the work and thoughts of many of these scientists and the scientifically minded philosophers prior to 1900, we thus become more keenly aware of the structure of their thought, both their knowledge and their ignorance, conscious and unconscious; and we cannot blame them too much for some of their hasty conclusions. After all, mechanics and thermodynamics produced the steam engine with its revolutionary effect on world economy; and in dozens of other ways science enabled man to do things, new in kind and vastly expanded in scale. Mechanics was the foundation of this great edifice of applied power and it certainly was tempting to argue that eventually every aspect of the universe could be explained in terms of mechanics. But just as this picture of the machine-universe appeared to be approaching perfection at the turn of the century, there came suddenly the remarkable series of discoveries including evidence for the break-up of the atom, the particle nature of light, curved space, and the interconversion of energy and matter. The culmination of this revolution was the proof of the wave-nature of matter complementary to the discovery of the particle nature of light.

The Atom As Music

In order to see pictorially the meaning of this new perspective, let us go back inside your atom of calcium which we observed earlier through the spectacles of classical physics, now putting on the more penetrating spectacles of the new quantum mechanics and equipping ourselves with a magic superhearing-aid. As thus equipped we step inside your atom which is 100 yards across, we no longer see the circulating particles but find the atom filled with waves and ripples, something like the ripples which we see on the surface of a pond when a stone is dropped in it. Occasionally, these waves pile up at points and there emerges something which looks like one of the particles in our earlier picture; but we get a new awareness that the behavior of the atom and its component electrons is much more clearly to be seen in these waves than in the motion of particles. Next we turn up our hearing aid and we perceive music. Some of this has familiar harmony, like the major and minor triads to be heard in the concert hall. But much of it is unfamiliar, full of relationships which, to be expressed mathematically, must contain very large numbers or even some of the irrational numbers not to be found in our familiar integral set of 1, 2, 3 and so on. Also, nearly all of it is dozens of octaves above the truly audible range of the human ear.

These electron waves which we thus "hear" are neither sound waves nor light waves; and many scientists feel that they are not strictly physically *real.* This, of course, raises the question of what we mean by "real," the question which has been explored in such a penetrating way by Henry Margenau and other physicists and philosophers who are keenly aware of the importance of clarifying the structure of our thought in this area. For our purposes, it is sufficient to point out that the electrons and all other fundamental

entities behave *as if* these waves are there. And it is hard to find any better basis for asserting reality than a pattern of behavior. So I think that Pythagoras with his vision of the universe as music or waves deserves as much credit as Democritus with his vision of the particulate or atomic aspect of matter.

Passing over for the time being the question of the reality of these de Broglie waves, let us examine in more detail the nature of the relationships which suggest the wave theory. One of the more familiar examples of one-dimensional wave motion is found in a piano string, say, middle C. When plucked, this string vibrates first of all with its fundamental tone of 256 cycles per second; the ends of the string remain motionless, fixed to the framework of the piano while the part of the string in between bows up and down, the maximum amplitude being at the middle of the string. But if we observe carefully, we also see that there is another kind of wave present with two bows. For example, the left half of the string may bow up while the right bows down, and in this type of vibration the string sounds a note one octave above the fundamental at 512 cycles per second. As we observe still more carefully, we see types of motion with three bows, four bows, five bows and so on, sounding notes corresponding to G, a higher C, and E and the higher *harmonics*. But we never observe a *fraction* of a bow because this would necessitate the movement of the end of the string, and this is impossible because the end of the string is fixed at its pin to the piano framework and cannot move. Thus the *boundary condition* of the *fixed ends* of the string forces our string to vibrate only with an integral number of bows. Thus, the modes and values of vibration of the string are determined both by the boundary conditions and by the weight and tension of the string. In the case of the string, we normally hear the simple harmonic overtones corresponding to some of the low integral numbers.

Now let us consider a two-dimensional wave pattern as found on the head of a drum; here, when the drum is struck, we get more complicated modes of vibration corresponding to ratios of larger numbers and even fractions. This is because the *boundary* condition around the *fixed rim* of the drum is very different from that imposed by the fixed ends of the string. We even get one set of vibrations for a round drum head and another for a square drum head, an infinite variety of vibration patterns for an infinite variety of head shapes! When we go to the three-dimensional case, a vibrating solid, we get even more various and complicated patterns of vibration. Thus a sphere vibrates with one pattern, an ellipsoid with another, a cube with a third. Even a statue like Venus de Milo has a set of vibrations or a harmony, the form in music which expresses the form in space.

Now the atom behaves much like the vibrating three-dimensional statue. Speaking now in a very general sense, the internal tensions and the boundary conditions make possible only certain definite vibration patterns. This means that the atom can exist only in certain *energy states*. In these energy states, the "frequency" of the vibration of the de Broglie wave takes on certain values only, and these **may be said to be the tones which we "hear" with our magic hearing aid. The invisible walls of its boundary** "box" determine the song of the electron as the walls of Petrouchka's box determine his dance. But while the use of wave mathematics for investigating the behavior of the atom is very helpful, it is possible to use other mathematical approaches as Heisenberg originally pointed out; thus mathematical matrices also provide a representation for these forms. So we conclude that the ultimate reality of the atom lies close to pure mathematical dynamic form. So proceeding on our journey of exploration we find ourselves,

"In die schoenen regionen
Wo die reinen formen wohnen."

Because music is in reality also pure dynamic form, I think that it is both suggestive and meaningful to say that the atom now appears to be music.

The Importance of Boundaries

Let us now contrast certain aspects of these two points of view, the atom as machine and as music. First of all, the particle picture implies *discontinuous* matter with *continuous* forces acting in *continuous* space. Now the primitive idea of *discontinuous* matter goes back to the early Greek philosophers who appreciated the difficulty of explaining the variety of the universe in terms of continuity; yet accepting this idea, it seemed reasonable to their successors to assign continuity to space and time and to the forces like gravity and electrical attraction which act in space and time. So in classical physics we had a picture of discontinuous matter and continuous action contained in a continuous cartesian space with the three dimensions of length, breadth and height (x, y, and z) all at right angles to each other. It was a simple universe with everything on the square. And time was regarded as equally simple in nature, flowing on continuously.

Now in looking at the way matter behaves, there are two **important aspects, the core and the boundary. You can hold in your hand a piece of matter and concentrate on it** and on the space immediately surrounding it; this is the core. Or, you can turn and look away to the boundary of the surroundings. And, if you look away, how far can you look and what do you see out at the edge of the horizon? These are the two perspectives, the core and the boundary; and the developments in many different parts of scientific thinking within the last century have emphasized more and more the fact that both are equally important. Moreover, there are both outer and inner boundaries.

In probing the nature of the space in which atoms act, the outer boundary comes to mind at once. Does space go on and on forever? Is space infinite? Classical physics answered *yes;* and this appeared to be a complete and satisfying answer to most minds trained in the thought patterns of western civilization developed over the last half dozen centuries. But to us today, this appears to be a lazy an-

swer. When loosely used, infinity is a word which implies a kind of repetitive process of thought with all the somnolent satisfaction that goes with repetition. We start out in space and we go on and on and on and on, and we jump to the conclusion that we can go on and on forever. But this concept of infinity is far from clear, if indeed it has any real meaning. It is therefore, striking that the theory of relativity points to a more significant kind of boundary to space, the finite hyper-sphere in four dimensions.

With regard to *matter*, the Greeks clearly saw that there was also a question of an inner boundary. Can matter be divided and redivided, and redivided indefinitely? They felt that here the answer was *no*. This hypothesis has been strikingly confirmed, of course, by all our evidence from modern atomic theory. Thus, we can take a piece of marble a foot-square and break it up into smaller and smaller fragments, and each piece is still marble. Each piece still has both the physical and chemical properties of marble. Chemically speaking, it still has the same formula as the original piece of marble, namely, calcium carbonate. These properties are still retained as the pieces are subdivided further until we get to fragments a few hundred millionths of a centimeter in diameter; for this is the size of a single *unit* of calcium carbonate, one calcium atom, one carbon atom and three oxygen atoms. If we divide further, we will find that one fragment is a calcium atom or another is an oxygen atom, either piece having completely different properties from the original marble. If we cut these atoms up, we get electrons and nuclei; and if we cut the nuclei up we get protons and neutrons; and the free neutrons spontaneously break up to give other protons and electrons. At this point, the concept of *cutting up* becomes meaningless. In other words, as we approach this inner boundary of matter, the whole fabric of law and relationship as well as the nature of the things related becomes different in kind. The concept of space itself on this small scale becomes meaningless. Thus, we get a clarified concept of *boundary* from the consideration of this *inner* boundary as we go to small dimensions. Matter is not continuous; it is not infinitely divisible; the inner boundary of matter is *not* infinitely remote.

Similar considerations apply to time. Here, because of the vectorial or directional quality of time, it is natural to consider first of all two outer boundaries. If we look backward in time, do we look backward infinitely far? Classical physics answered *yes*. If we look forward in time, do we again look forward without limit? Classical physics, likewise, answers yes. Is there an inner boundary to time similar to the inner boundary of the nature of the matter at small dimensions? No one knows. Later we will explore further the boundaries of time, because it is only through the study of matter in action that we can dissect time, and the existence of an inner boundary of matter does suggest an inner boundary of time.

Let us now consider other ways in which these new approaches change our fundamental scientific thinking. One of the most striking is concerned with the question whether "the whole is equal to the sum of the parts" or "the whole is more than the sum of the parts." In the mechanistic description of the atom, the situation is best expressed by the first statement. If we understand exactly the nature of the gears and pinions and other mechanical parts of a watch, it is fair to say that we understand how these parts will behave when linked together into the whole. The possibilities of behavior of the whole are contained in the possibilities of behavior of the individual parts. But, in the case of waves, at the deeper level of pure form, this is no longer true. Here, the whole is *more* than the sum of the parts. The dynamic aspect of form, the possibilities of "feedback," of intimate interaction yield this result; and one has to go to a very deep level in the interpretation of the meaning of form to grasp this principle completely. In some of his books on quantum mechanics, Hermann Weyl tries to make this point clear. For example, he says, "In fact every vector in the product space represents a possible wave state. In this very radical sense, quantum physics supports the doctrine that the whole is more than the combination of its parts." Thus, from the mathematical point of view, in trying to grasp the meaning of form and the meaning of *existence* of form, we come to a new perspective. Instead of thinking of a form existing in space, we realize that we have a choice of many different kinds of spaces in which to represent the form and we can even say that a form can create its own space, that form transcends space.

In order to clarify these concepts, let us consider further certain atomic phenomena. When atoms are grouped together, aspects of behavior may be associated with the behavior of the group as a whole but not with the atoms acting separately and individually. There is in the collective behavior something more than is found in the individual part. Frequently, when we try to express this collective behavior in terms of ordinary three-dimensional space and time, we are faced with great difficulties and complexities. On the other hand, if we can think of each atom as having its own private dimensions, we can express the behavior of the collection of atoms in multidimensional space in a way which delineates the pattern of form more significantly. This is true for the description of the collective motions of a group of atoms bound together in the form of a molecule, where the possible motions depend on the geometric and potential force pattern of the group as a whole. It is true for cooperative phenomena such as the conduction of electricity by metals, particularly true for the strange kind of superconductivity which is found at extremely low temperatures within a few degrees of the absolute zero of temperature. To express most elegantly the group behavior of electrons associated with an atom nucleus or with several atomic nuclei, it is frequently necessary to use a space of an infinite number of dimensions. Such spaces originated in the mathematical methods developed for treating functional relationships, and the generic term ***Hilbert space*** is often used to refer to them, in honor of the mathemati-

cian David Hilbert who fathered them. When one sees the need for these more sophisticated approaches in dealing with phenomena associated with the fundamental particles of the universe, one is tempted to ask whether any special kind of space has an exclusive claim to reality. If the totality of relationships points toward multidimensional space as providing the most significant framework for understanding the universe, should we conclude that we actually live in multidimensional rather than three dimensional space? From the common sense point of view, you may say that you yourself are obviously a three-dimensional collection of atoms with certain powers of movement, definitely located at a point in three-dimensional space and time, sitting still at this moment. Well, where are you? I think it is easy to see in this proposition the flavor of what Whitehead calls the deceptive nature of hardheaded clarity. You feel that you are sitting relatively still. But, of course, remember that the earth is turning and that actually you are moving at approximately a thousand miles an hour through space due to the rotation of the earth. The earth is also moving in its orbit around the sun so that this means your path is actually a spiral with respect to the sun. But, of course, the sun is not standing still either. It is a star somewhere near the outer border of our saucer-shaped galaxy which, in turn, is rotating. Our galaxy may be said to resemble a kind of saucer which is turning in space, and this motion with respect to other galaxies superimposes another component on your spiral around the sun. The galaxy is also moving, we believe, participating in the general movement of the universe which produces the red shift in the light of the farther galaxies. This is a movement in which the galaxies seem to be flying apart from each other at an enormous rate of speed. So your sense of sitting still is very deceptive.

But, you say, "At least, I am concentrated at a particular volume in space. I am not in New York at this moment. I am in Boston." Do not be too sure about that. Consider your relation to the universal force of gravitation. The reason why you are sitting fixed and not floating around in the air is because there is a force acting between each of your atoms and the far more than trillion tons of matrix rock making up the core of the center of the earth. Your atoms project a force field to all these earth atoms, and that isn't all. **Your force of gravitation also reaches to the moon, to the sun, and to every other atom in the universe.** Because of this, any motion of any one of your atoms moves the rest of the universe. Our understanding of this relationship is still rudimentary but it suggests the truth in the line from Francis Thompson that "thou canst not stir a flower without troubling a star." And not only your gravitational field but also the atom-waves of which you are constituted extend out beyond the apparent boundaries of your body. A little of you is outside this building and you are spread out even beyond that, no one can say exactly how far. Until we understand much more precisely the nature of these interactions, it is impossible to say exactly where you are. So, if there are arguments that collective behavior can be more fully *understood* in multidimensional space, then it is reasonable to ask whether this does not suggest the *existence* of dimensions beyond those of familiar spacetime.

There are many other aspects of the new physics which imply the necessity of exploring further our scientific philosophy and its relation to the broader questions of life. There is the curious question of the identity of individual particles associated with the Pauli exclusion principle. There is the Heisenberg indeterminacy principle, which ties more closely the act of observing to the observation. Niels Bohr reminds us that we are both spectators and actors in the drama of existence. So if in our action there is some factor which is more than the sum of the parts, in what space does its reality lie? What are the dimensions of the spirit?

The Dimensions of the Spirit

In order to explore this area, let us turn first to the aspect of the universe as music which distinguishes it sharply from the machine, namely, the probability aspect. In the light of the Heisenberg indeterminacy principle, we conclude that in this new wave universe action is not completely predictable. It is not determined by the iron law of cause and effect. Where the wave exists there is a probability that something will happen, but it does not inevitably happen. Some physicists feel that this provides the basis for free will in man. They say that our actions are determined by our thoughts, and our thoughts are associated with processes at the atomic level. *Ergo,* if our atomic behavior is not predetermined, we have free will. Others are skeptical and say that when we understand these waves better, we will find the same old law of cause and effect operating between them, and we will be right back in Petrouchka's box of determinism. Still others claim that the very mathematical structure of relationships describing the behavior of these waves excludes the possibility of a deterministic chain. At any rate, determinism has not been re-enthroned as of today and there is nothing as far as I know which suggests that it will be in the future. On the contrary, there are clearly these gaps in the chain of interaction of forces. Someone remarked that it will be unfortunate if we have to find God only in the gaps. But since a chain is as open as its weakest link, this open door in our logic deserves a careful look to see where the path leads through it.

Scanning the phenomenon of human life, one is struck by the fact that in the collective behavior of these octillion body atoms, there is some kind of entity which transcends the changing pattern of the atoms as they come and go in the metabolic process. We know from recent experiments with radioactive tracers that all parts of the body slough off old atoms and take on new ones. It has been stated that we get a new liver every six weeks, though the bones undoubtedly change much more slowly. Sometimes the statement is made that on the average we get a new body every

five years. It is too early still to assess the exact speed of these changes in every organ, but it is striking that in parts of the body like the brain we may have a very rapid replacement of atoms through the course of metabolism and yet somehow retain memory and those directive powers which keep the course of life rolling on in coherent fashion. There seems to be an invariance under transformation, a whole which does far transcend the sum of its parts.

Can we be bold enough to say that in view of all these bits of evidence we can speculate on the possibility that we *really exist* in a hyper-Hilbert space, and that this three-dimensional space, which appears to be so obvious around us, is only a rather trivial and shallow shadow? Can we admit the possibility that the human spirit has certain aspects of an invariant vector amid all this vast transformation of atomic coordinates? And granted that there is this transcending of the changes of metabolism, can this spiritual vector transcend the changes of death? If the vibrations of our octillion atoms appear to be like the swarming of an almost infinite army of gnats, is there a meaning beyond that of continued confusion?

Although we certainly cannot say that the indeterminacy principle proves the freedom of will, still it does look as if the door is open in that direction. Somehow in these dimensions of the spirit, there is a quality that not only transcends the iron law of cause and effect but has within it the spark of creativity and of moral responsibility. Kirkegaard expressed it, "But what is this myself? It is the most abstract and yet at the same time the most concrete of all realities. It is freedom." Stace calls it that spark of God buried in man. If we find an implication in the new physics that this spark transcends space, does it transcend time? This again mathematically speaking appears to be a boundary problem; and we are certainly getting new evidence today concerning the nature of the initial boundary of time. It is still too early to be sure, but one cannot help but be impressed with the evidence that suggests an initial creative event in the universe. For when we extrapolate back in time the motions of the nebulae, it looks as if all the matter of the universe may have been once approximately at one point some five to seven billion years ago; and the rate of radioactive decay of some of the heavier atoms indicates that somehow these nuclear processes all started about five billion years ago. This may be a crude interpretation of the facts but it does indicate that somehow time does not extend back uniformly, that somehow there is a boundary condition on time just as the curvature in relativity suggests a boundary condition on outer space.

Curiously, there appears to be little interest in scientific circles today about the symmetric image of this, the nature of the boundary of time *ahead* of us, but it seems to be a meaningful question to raise. Niebuhr is really stating this boundary problem when he says that the end of time in eternity is not a point in time. Just as the journey into the infinitesimal brings us to a new set of laws and relationships when we get to trillionths of a centimeter, a journey backward in time brings us to new relationships when we go back by something like a quadrillion seconds, and a long journey forward may bring us to an equally strange land. So let us pause for just a moment to think about these relative sizes in time. In one second of time the waves of an electron in a hydrogen atom in the skin at the tip of your finger execute some quadrillion vibrations, more vibrations than there have been seconds of time since this initial boundary which we appear to meet when we go back five billion years. Thus, although five billion years may seem almost infinite in terms of the human lifespan, the ratio of our lifespan to the smallest significant time intervals within us is so great, that relatively, creation took place yesterday.

We have seen that our conception of the infinite has been largely a conception of ignorance. It even has the flavor of laziness, of repetition beyond repetition beyond repetition, until we can think no farther. Actually, the careful examination of the concept of the infinite by mathematicians within the last 75 years has made it clear the idea has quite another meaning. There are now the three distinct kinds of infinity recognized, the class of integral numbers, the class of all real numbers, and the class of functions or forms, with the latter in a sense being the largest of these three infinities. So far, there has been no significance found for a concept of still larger infinity, though there is nothing to show that it cannot exist. Just as the older concept of infinite space has been altered through relativity and as the concept of infinite time preceding our existence appears to be altering, we can logically ask whether there is not a significance in the ultimate end of time. Somehow the totality of the reality of the universe does seem to transcend both our narrow concept of space, our narrow concept of time and our narrow concept of action. As Santayana put it, spiritual peace will lie in another dimension. I think that Hermann Weyl is pointing in the same direction when he says, "Whether or not the view is tenable, that the organizing power of life establishes correlations between independent individual atomic processes, there is no doubt that wherever thought and the causitive agent of will emerge, especially in man, that power is increasingly controlled by a spiritual world of images." Is it not in order, then, to ask whether this new evidence on the nature of reality does not suggest new dimensions in which to regard man? In our thinking should we not try to break out of the conventional three dimensions of space and the fourth dimension of time when we try to see the meaning of life, physical and spiritual, in a unified perspective? I suggest that the evidence points toward a new conceptual framework which will put into focus the forms of the spirit, with dimensions which provide for the creative aspect, the moral freedom of the human soul, a hyper-form space bounded by the infinity of our Creator.

Man is not a puppet in a box. The boundaries of man are the mansions of eternity.

Dr. Andrews was B. N. Baker Professor of Chemistry at The Johns Hopkins University. The preceding paper is the preliminary draft of an address given at the Colloquium on The Nature of Man, Boston, May 23, 1959.

SYLVIA SCAPA
AND
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What is Water?

SOME PROMPTINGS OCCASIONED BY RECENT DISCLOSURES OF THE CHARACTERISTICS OF WATER, THE CARRIER OF LIFE

WATER IS THE ELEMENT of life par excellence. Goethe once wrote, "Everything originated in the water, everything will be sustained by water," and he was by no means the first to make such an observation. Anyone who has ever been more than a little thirsty can confirm the fact for himself. It is perhaps just because the importance of water is immediate, familiar and universal that we have been inclined to regard it for what it does for us, rather than for what it is. So it has been until fairly recently, when new techniques began to permit us to examine some of the constituents and characteristics of water which had previously escaped definition. Even so, it is difficult to bring anything as fundamental as water under the kind of holistic treatment which we now feel is necessary for the proper understanding of things and processes. Like many of the other "givens" of our experience, it is usually examined from a particular point or points of view, usually pragmatic. However, biology, in its search for the fundamental blueprint of life, has added another dimension to the study. For here, at the root of living processes, water cannot be ignored. If we are ever to understand what life may be, we must take account of the ambient medium which sustained its entry on the scene, and which still plays so large a part in all biological functions.

It has long been known that life was born in the water, and that water is the most dynamic and essential constituent of every living thing. All organized matter, from protoplasm, the basic stuff of life, right on up through man, is in itself essentially watery. Thus even the solidest-seeming animal is basically a fluid creature, whose stable form is more like a vessel enclosing its vital liquids than the solid mechanism it appears to be. We tend to think of the body as a fairly substantial organization, possessing, among its functional systems, a vascular system through which the circulating blood forms its principal life fluid. But in fact most of the water in the body is not in the blood stream, but rather inside and between the cells as a thin film. The water inside the cells (about 30 quarts, in contrast to 5 quarts of blood) acts both as a solvent and as a raw material in the chemical reactions of life.

Today we are able to catch a glimpse of the larger significance of water in the physical and biological evolution of our planet because of recent contributions to the study. Some of these begin to shed new light on this ancient Element (for so it was, to the Greeks and the Vedic Hindus).

It is inadequate to try to define water by saying that it is a liquid, for the fluid state turns out to be more mysterious than the solid, and what is more, water is an abnormal liquid. It displays properties which are very different from those of other liquids. For example, when water melts it contracts, so that its density at 0°C is greater than that of ice; it continues to contract until it reaches its maximum density at 4°C. As Giorgio Piccardi has put it, "The 'physical scandal' of a body whose density rises with the temperature has provoked a great deal of thought among scholars since the year 1667. . . ." (1) There are other characteristics which reveal the abnormality of water. Its surface tension is remarkably higher than that of other common liquids, the latent heat of ice fusion is the greatest known, save for ammonia, the latent heat of water vaporization is the greatest known, and the specific heat of water is abnormally high. What is the relation? Many of the properties of water display oddities between 30 and 40°C, and especially at 35°C (at which it has been determined the specific heat of water is at a minimum), a sign which indicates that something very important is occurring to the structure of water. The biological importance of this general fact was pointed out by C. Magat, since this temperature corresponds to that of the warm-blooded animals. (2) Piccardi also points out that water has other subtle and evasive properties, so far of more interest to biologists that to chemists or physicists. He says,

> Why is it that natural water drunk at a spring is more effective from a medical point of view than the same water bottled and aged . . . in spite of the fact that the difference in chemical composition reveals nothing in particular? It is certainly not the small variations in common salts content that justify the efficacy of this or that water. . . . Today we are beginning to speak of changes in the biological properties of water due to the heating and subsequent cooling of the water, which does not return to its previous state from a biological standpoint, even if we replace the gases it had lost during the heating and return it to exactly the same conditions in which it was found previously. (1)

Even though water is a very special liquid, and shows in many ways a behavior different from that which would be logically expected, it *is* nevertheless a liquid and therefore partakes of the physical structure of all fluids. In an effort to arrive at a better understanding of the liquid state, J. D. Bernal, the well-known physicist, tried to find a mathematical expression for the structure of liquids. He succeeded in discovering some interesting polyhedra with thirteen faces, each face a pentagon. At the same time, he noted the difficulties which are encountered in this kind of research:

> Attempts at a more fundamental approach have been frustrated by the hybrid nature of liquids. At once highly condensed and completely disordered, they present a very difficult mathematical problem.
>
> When a crystal is heated the molecules vibrate and move farther apart, but do not change their neighbors. When a liquid is heated, on the other hand, both the identity and the number of neighbors change. A liquid therefore corresponds not to a single crystal phase but to a continuous series of such phases, each stable only for a single temperature. . . .
>
> All this suggests what seems to me the simplest way of characterizing the states of matter in terms of molecular or atomic structure: crystalline solids have regular and coherent structure; liquids irregular and coherent structures; gases irregular and incoherent structure. (3)

This kind of thinking seems to establish a link between fluids and the rigid structure of solids. The difference lies in the factor of mobility; the fundamental crystalline structure is there, but it moves in space. Hence time is engaged, and a new dimension is added. Passage from the solid phase to the liquid is made possible by an exchange of energy. We well know that when the internal energy of a molecule of water is lowered (as expressed by the temperature), the water takes on the rigid form of a static crystal. A shift from the three-dimensional solid to the four-dimensional liquid (if this term may be used to imply the added time factor) thus requires the use of energy. Another quotation from Bernal is pertinent:

> The idea of pseudonuclei helps to explain the phenomena of supercooling and glass formation [glass is considered a solid liquid]. As the temperature is lowered and energy is exhaled from an irregular array, it may fail to crystallize because the energy of snugly packed pseudonuclei is less than that of the same molecules in the regular array they adopt in the crystal. The reason why at low temperatures the crystal as a whole has lower energy is that it does not have the relatively high energy holes that must necessarily exist between nuclei.
>
> The picture I have sketched so far is essentially static, but it provides a basis for explaining dynamic fluid properties as well. The essential feature of an irregular array is that there is at any temperature a number of arrangements differing by very small quantities of energy. To go from one to the other is very easy and this must occur spontaneously all the time. Thus a liquid has not one structure but a large number of equally

likely structures and is in constant flux between one and another. In each changeover some molecules change neighbors. The molecules move about in a random way; after a series of changes original neighbors find themselves far apart; in short, molecules diffuse. (3)

We must therefore not lose sight of the fact that, however mobile and changing water may be, it is nonetheless rooted in the three-dimensional solid world. This foundation of almost infinite variation on one theme is expressed in the crystals which nature never fails to shower upon us whenever conditions permit. (4) But see! They are rigid earthy hexagons, not the plastic watery pentagons of the polyhedra detected by Bernal in fluids. So at the very start of the inquiry the mystery deepens. As ice, this wonderful fluid must obey the geometric rules of the static world. Turned back into water, its incessant internal motion restores its relationship with time's flow and life's viability.

What else is water?

Considered from another point of view, water is a molecule—a molecule made of two elements. One is the fundamental element hydrogen, the first of the organized energy bundles we call atoms: one proton, one electron. The second element, oxygen, for reasons not yet understood, is that which plays the essential role in energy transfer, especially in relation with carbon and hydrogen. (These last, in combination, are present in all plant and animal tissue.) Any molecule or combination of atoms will give up energy in the process of combining with oxygen. If it is a fast process it is called combustion; if slow, it is oxidation. When the molecule has taken in all the oxygen it can accept, it has no stored chemical energy left.

Hydrogen is of particular interest because it can form what is called in chemistry a "hydrogen bond." This bond plays a very essential role in the organization of living processes, (5) but first let us consider it in water.

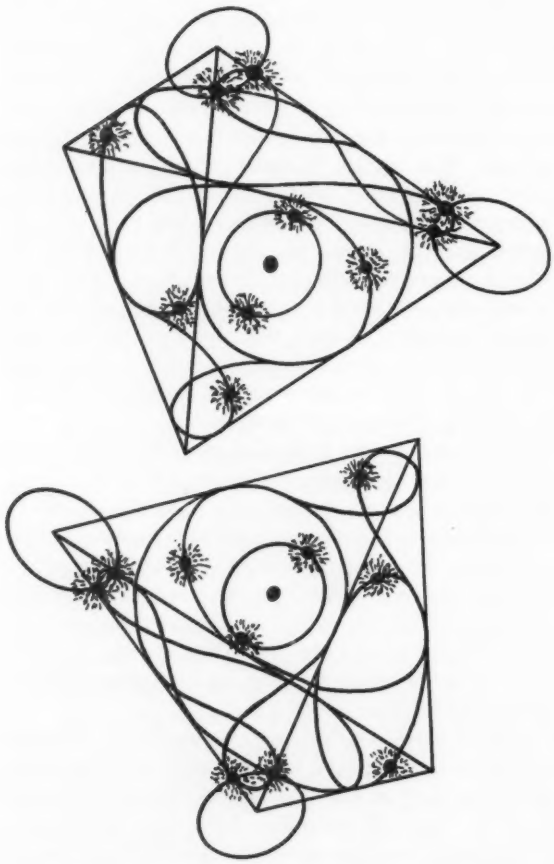
Oxygen has a valence of two. This means that there are two unpaired electrons in the outer circle or orbital, and that it lacks two of the eight electrons required for stability. It can accept two hydrogen atoms and be satisfied. Thus one of the unpaired electrons of oxygen will pair off with the unpaired electron of hydrogen, and they will spin together happily. This is called a covalent bond, and its strength is demonstrated by the intense heat which is generated by the oxy-hydrogen flame of a welder's torch, and which throws off droplets of water. Since the same thing is true of oxygen's second unpaired electron, one atom of oxygen readily combines with two atoms of hydrogen to form one molecule of water. At this stage the atom of hydrogen is very small, for with its electron spinning on the side of the oxygen, it is reduced to its single proton or positive charge. This charge is not completely neutralized by the electron which the hydrogen atom shares with the oxygen, and therefore it will attract with a much weaker force and negative charge in its surroundings, and make a weak bond. This ability to make a bond much weaker than the covalent bond, which attaches it to oxygen to make water, is called the hydrogen bond. It may be thought of in these terms: that the hydrogen is attracted by rather strong forces to two atoms instead of only to one, and that it acts as a bond between them. It is now recognized that the hydrogen atom, with its single stable orbit, can form only one covalent bond, and that the hydrogen bond is largely ionic in character and is formed only between the most electronegative atoms.

This bond will tie the hydrogen atom (or rather, this proton, for since the hydrogen atom has given up its electron to spin near the oxygen, this is all that is left) to any electronegative atom; the one which is closeest at hand is the oxygen atom of the nearest water molecule. In other words, water is a net of weak forces attracting molecules between them. This bonding is so unique that Lennard-Jones and Pople hold that in water there exists a network of bonds extending throughout the entire liquid which is, in a sense, one large molecule. (1)

In order to break the hydrogen bonds, forces stronger than those already present are required; these are provided by the energy of vibration in the molecule, which is produced by high temperatures. When we heat water, these vibrational energies overcome the hydrogen bond, the molecules tear apart, and the water is vaporized. (The much stronger covalent bond between the oxygen and hydrogen atoms needs much more energy for its separation, thus there is little likelihood of the disintegration of water.) We therefore can see that water, at least when it is within the temperature range of life, is a continuous field of forces with negative and postive charges alternating harmoniously.

Modern knowledge has now made it possible to elucidate the disposition of the oxygen atom and the hydrogen atoms within the water molecule, and thus to deter-

mine its structure. It is becoming clear that many of the characteristics which make water the unique substance it is come from these two factors: the configuration of the three atoms which determine the structure, and the distribution of electrical charges among these atoms. In 1933 Bernal and Fowler revolutionized the concept of the constitution of water by describing the distribution of electronic density in the molecule as resembling a tetrahedron. Later modified by Pople, this theory now describes the way in which the water molecule tends to form hydrogen bonds in tetrahedral directions—bonds which can stretch or bend independently without breaking, and which can absorb large amouns of energy.



L. and M. Milne have described this simply and clearly:

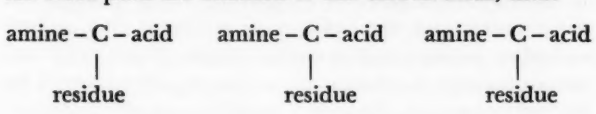
> The disposition of the hydrogen atoms at two corners of the tetrahedron, leaving the other two vacant, gives polarity to a water molecule and accounts for the remarkable abilities it has to serve as an almost universal solvent, for its role in forming acids and alkalis, for its great inertia to change in temperature, for the amount of heat it must absorb to evaporate, and for its strange increase in bulk upon freezing. In ice, the tetrahedral molecules form a regular latticework with a great deal of space between—more space than among the freely moving molecules of liquid water. This makes ice lighter than an equal volume of water, and lets it float. Upon thawing, the lattice collapses and the molecules that are freed fit into the spaces of the slush. (6)

This, then, is a brief sketch of the chemical nature of water itself. When we come to the larger question of how life arises and expresses itself in water, many other considerations come to mind. We must be careful not to employ only mechanistic-logical processes. It is natural to ask, for example, were atoms organized before molecules? Were molecules organized before the appearance of any organism? Before any such questions are answered with natural impatience, considering only their logical sequence, we must think of the exquisite organization within the living cell, which so many geniuses of our time are succeeding in breaking down. It is hard to believe that such sophisticated molecules as proteins and nucleic acids could have been brought in as raw materials. I am more inclined to think that the complexity grew as the need for expression grew, if one is permitted this kind of subjective criterion. Expression of what? At present we can only say of life, whatever that may prove to be.

Carbon, oxygen and hydrogen make a sugar molecule—a ring, empty inside of course. Two rings unite, then three, then many, and so a chain is formed. Let us not forget that the atoms of carbon, hydrogen and oxygen are joined by their electronic binding, either a covalent bond or an ionic bond; therefore it is always force that holds them together. The chains, giant molecules, straight or branched, organize themselves in helical chains to form starch and cellulose. These three elements, carbon, hydrogen and oxygen, spiced slightly with the magnesium of chlorophyll plus a few trace metals, go on to build all the structures of the vegetable kingdom. Those structures are never separated from water. Hydrogen bonds with surrounding aqueous solvent are characteristic of the structure of wood and cellulose and starch. Thus we see that living substance becomes structured by building loose barriers; it is compartmentalized, and becomes a separated entity by means of those barriers which are always made of positive and negative charges. When we turn to the animal kingdom the picture is somewhat further complicated, for two new elements appear, nitrogen and phosphorus. Nitrogen, carbon, oxygen and hydrogen will twist themselves around in order to form the barriers through which water flows back and forwards in the play called organic life. So protoplasm is born.

When a chemist looks at living animal organisms, what does he see? Nineteen different molecules called amino

acids* are organized into a variety of chains not very dissimilar from those of the vegetable kingdom, the cellulose, but forming an unlimited variety of tissues unknown to the lower kingdom. These fundamental building blocks of the protein and therefore of living protoplasm can be figured as having three important parts: two side arms, an amine on one side and an acid on the other, and the main body, which is usually called the residue, denoted by the letter R, and which characterizes the specific amino acid. All three parts are attached to one carbon atom, thus:



(There may be ten, twenty, forty or a hundred of these in one protein; it is not yet understood why or how.)

The amine and the acid form a bond and unite, making molecules of various lengths by the soldering, so to speak, of amino acids side by side. The sole purpose of the amine and the acid seems to be to form the chain. It is not quite clear what the sequence of residue does to the protein, which turns up as a hormone, an enzyme, or anything else. As yet we only know that each protein has a very specific role, though many workers all over the world are trying to understand this relationship. The nature of the carbon atom is such that the valences go to the four corners of a tetrahedron. The protein chain, therefore, is not straight, but crooked. And because of other stereochemical conditions, this zigzagging line folds itself into a helix.

*For whose to whom the term amino acid has only a generalized meaning, I might add that it is a compound which possesses both an amine function and an acid function. A "function" or a "functional group" is a group of atoms which have a set of properties. There are the properties of the base (like turning litmus blue), and there are the properties of the acid (like turning litmus red). By being added to one another, each loses its properties, and we are left with a compound which has the properties of neither, and is called a salt. Amine is a family of compounds with certain specific characteristics, just as alcohols have their own characteristics. Derived from ammonia, with similar properties, amines readily combine with mineral acids with a strong bond to form a stable compound—a salt. Ammonia is essentially basic (that is, alkaline, for alkaline equals basic), just as caustic soda and caustic potash are also, but to a different extent. Ammonia is the weakest base of the three, e.g., it is the least alkaline.

In inorganic chemistry it was found that many compounds have, at the end of their molecule, this group of atoms called the functional group. In the case of amino acids, the size of the body may vary from one carbon to a great number—thirty or forty or even more—but all have at one end this amine group which gives its function to the whole. Proteins are giant molecules built up from a number of different amino acids.

The sum total of the properties of a compound is composed of those due to the length of the body (the chain), plus the properties due to the functional group. Thus a functional group of alcohol might be found at the end of a chain having one carbon (the alcohol in whisky) or no carbon (wood alcohol) or thirty carbons (like the alcohols that go to make wax). Wax is a salt (compound) made of alcohol and an acid. In this case the salt is called an ester. So when we say a function or functional group, it means a group of two or three atoms which have a specific function.

What about the residues, which are made, let us not forget, of carbon, hydrogen, and an occasional nitrogen and oxygen atom? These residues, following their own stereochemical structure, fold in several directions. When a hydrogen atom finds itself near an oxygen atom, a hydrogen bond results, creating a firm but flexible link between the two molecules, somewhat as though they were held together by a rubber band. There are, in addition, the many bonds between the hydrogens of the residue and the oxygen of the solvent (water, in this case), and between the hydrogen of the solvent and the electronegative atoms of the molecule. All this bonding insures that the protein molecule is both well and firmly put together, and at the same time flexible, since all the bonds are elastic. The protein molecule is thus well bound to the water, or rather, we say, water is bound to the protein.

This whole complex, of course, is not a static mechanism, but is perpetually in motion. For example, if we add to this solution of protein an amount of water whose atoms are labelled D_2O, deuterium or heavy water, the atoms of deuterium will end up in the molecule of protein in ratio proportionate to the specific affinities. This is evidence that there is a continual exchange, and that the system is statistical rather than static.

These giant molecules which form the basis of life are a natural organization in which water plays a fundamental role. In primitive organisms (both vegetable and animal), the creature is itself organized within its watery milieu. At the simplest levels it is almost one with that milieu, for compartmentalization is poor. As evolution proceeds into more highly organized forms, compartmentalization becomes perfected, and the organism is identified more sharply, yet in itself each living creature remains essentially a form of organized water.

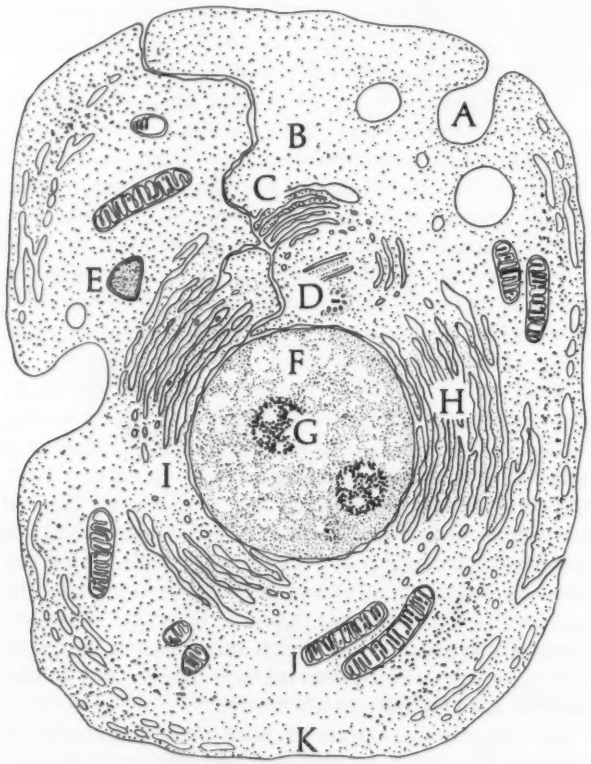
Today there are three types of giant molecules which have captured the attention of biochemists. These are the nucleic acids, the proteins, and the lipids. The lipids certainly have their role in the organization of living matter, for, being unmiscible to water, they are probably the tool for compartmentalization. They do appear structually in membranes and cell walls. The nucleic acids, which embody the coded blueprint for reproduction, seem to be the tool used in the transferral of genetic heredity. They have deservedly captured wide interest and attention, and more and more light is being shed on their obscure and hidden ways by contemporary biochemistry.

Like the proteins, the nucleic acids are made by multiple addition of one group of molecules called a nucleotide. Roughly put, there are three parts to the nucleotide: a base, which plays the role of the residue in protein, and two side arms which join hands—a phosphoric acid molecule and a sugar molecule, ribose in the one (DNA) and desoxytibose in the other (RNA). So much has been written about these that they are now familiar terms to all. So the scheme again follows the same pattern:

Phosphate-sugar-phosphate-sugar-phosphate-sugar
| | |
base base base

There are nineteen different residues for the protein, but in the nucleic acid there are but four bases which play the total role. Here again, the chain rolls on itself to form a helix, which in this case is double. In similar fashion to the protein, the free hydrogens will form hydrogen bonds within the molecule and with the solvent; at the molecular level, again, the molecule is an integral part of the solvent—water.

Present investigations seem to indicate that the proteins play the major role for life. It is difficult to say how many thousands of proteins are manufactured in the cell. Among all the information now being gathered about the proteins, we must not lose sight of the important point that what constitutes a protein of the nineteen amino acids is the balance of electropositive and electronegative charges which holds it together in water. This is exemplified in two of the proteins which have been elucidated fairly well, and whose names are now well known; ribonuclease and ACTH. Intensive work on unravelling the chemical structure of ACTH began back in the 1940s, and during the long struggle to identify the hormone, much was learned about the amino acids.



The Living Cell

A. *Pinocytic Vesicle*
B. *Cytoplasm*
C. *Golgi Body*
D. *Centrosomes*
E. *Lysome*
F. *Nucleus*
G. *Nucleolus*
H. *Endoplasmic Reticulum*
I. *Nuclear Membrane*
J. *Mitochondria*
K. *Cell Membrane*

Thus through the portal of the giant protein molecules, we enter the world of the cell.

He who fails to experience a thrill of awe at this introduction must be entirely devoid of imagination, for here, in the microcosm of life, are displayed all the grandeur of organization and the delicacy of structure that nature embodies in her greatest orchestrations. Familiarity can never diminish this feeling of awe; it is only enhanced by the reflection that through a combination of invention, careful fact-gathering, and deductive reasoning, man has been able to reconstitute in part the image of this life-unit.

Fascinating as such a diagram may be, it is nonetheless only a cold and static blueprint of a dynamic reality, an on-going process wherein the different functions operate symbiotically in harmonic relationship to preserve and fructify the whole, and where the pulse of life sends the myriad molecules moving smoothly and quietly, yet at amazing speed, within the watery matrix.

Water is indeed the matrix of life, not of ages past, but here and now. All the molecules in the cell, in the blood stream, in the extra-cellular fluid, are held together in water. If we consider our human skin to be an envelop surrounding the skeletal form which holds it erect, we realize that the body is no more than a series of porous compartments in and out of which water is continually flowing. A. V. Wolf describes this well:

> Water pervades all tissues and organs, but physiologists maintain the convenient fiction that body water is compartmentalized; part of it is in the bloodstream, part is inside the cell and part fills the spaces in the body cavities and between the tissue cells. Actually body water scarcely recognizes anatomical boundaries—it diffuses, percolates, and otherwise migrates about the body. The water in the bloodstream, for instance, passes continuously and rapidly across the enormous collective surface of the capillaries; if we could suddenly label all the water molecules in the blood perhaps only half the labeled molecules would remain in the bloodstream one minute later. (7)

If we remove water from the living organism, all functions cease. If we take a solution of protein and add to it a small amount of another solvent, such as alcohol, the protein will separate out of solution and precipitate; we say then that the protein has been denatured. It cannot live outside its own native habitat, water—or, to be more exact,

out of a water solution containing a specific amount of inorganic salts.

Another interesting point is that the quantity of water required for a specific species is regulated within narrow limits. To quote A. V. Wolf again:

> On the average an early human embryo is 97 percent water; a new-born baby 77 percent, an adult man 60 percent. The water content of the human body falls rather sharply from birth to an age of about four years, when it levels off. Indeed among mammals in general the proportion of water in the body drops in this manner until "chemical maturity" or relatively constant composition is attained, about a twentieth of the life span. Still, body water continues to diminish slowly with age. As the body dries out its metabolism as measured by its rate of oxygen consumption per unit of body water does not change with age, as though the water content of the body were a measure of its vital activity. *It would appear that the flame of life is sustained by water.* (Italics added)
>
> . . . A comparison of the water requirements of various animals reveals some interesting, though tantalizingly obscure, relationships. In animals ranging in weight from a fraction of an ounce (for a mouse) to several tons (for an elephant), the logarithm of the average rate of water intake plotted against the logarithm of the body weight results in a straight line. This indicates that water intake in dissimilar animals varies according to the 0.88 power of the body weight. An amazing assortment of biological variables (e.g., heart rate, urine flow, blood volume, nitrogen excretion) is similarly governed by a characteristic power of the body weight. (7)

It is natural to conclude, from the foregoing evidence, that molecules which begin to be loosely organized in water gradually acquire a more separate identity as they go higher in the scale of organization. Even the simplest of all living things, the protoplasm of a slime mold, is a very complicated story of macromolecules tied together by loose bonds and loose barriers, made of physical forces such as hydrogen bonds and surface tension. The water flows in and out of this complex system, very well behaved both chemically and structurally. The mechanism could be compared to a soluble sponge, loosely knit yet an organic whole, which cannot live unless in water.

Thus there emerges an image of the living, fluid, insubstantial, yet immensely powerful. That flame of life is not so easily snuffed out; damped down, it runs along hidden ways to spring up once more. We seem to see, in the microscopic world of atom, molecule and cell, the physical representatives of a different kind of force field. To be sure, the electronic components are conspicuous, and the tendency therefore has been to cling to the idea that in the end life is only electrodynamic. But when we recall that the bonds are resonant, which is to say harmonic, in character, the notion of a force field specific to life emerges. Then, going one step further, one is obliged, in thought at least, to put the question: If there is a life force field, what are its self-proportioning rules? The answer to this question is all around us in the living forms of field and forest, pond and sea.

If the slime mold were capable of self-examination, he would find it difficult to imagine to what level of organization and delicately balanced reactions his organism would climb in the long process of evolution. Least of all, we suspect, would he anticipate that he would have to take his pond with him in this journey—of necessity, because he is not only a strange event *in* water. He—and we—*are* water. In spite of all that we are discovering today with our wonderful modern techniques, we are thus forced to come around again to the fundamental question with which we began, and which still remains largely unanswered:

What is Water?

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W. HEISENBERG

Wolfgang Pauli's Philosophical Views

TRANSLATED BY KURT LEIDECKER

TOWARDS A NEW UNDERSTANDING OF THE UNITARY ORDER OF THE COSMOS

WOLFGANG PAULI'S contributions to theoretical physics permit only in a few passages a glimpse of the philosophical background on which he has established them. To his colleagues, Pauli appears first and foremost as the brilliant physicist, always endeavoring to be most precise in his expressions, the physicist who has decisively influenced and enriched the physics of our century by his significant and novel ideas, by his analysis of existing knowledge which is lucid to the very last details, and by his unsparing criticism of all vagueness and inaccuracy in theories that scientists proposed.

Were we to construe Pauli's basic philosophical position on the strength of his natural science statements, we would, at first, be inclined to arrive at the conclusion that he professes an extreme rationalism and espouses a skepticism with respect to principles. In reality, however, a deep philosophical interest was hidden behind his ostentatious critical attitude and skepticism, an interest which extended even to the obscure realms of reality or the human psyche inaccessible to reason. The vigorous fascination which Pauli's analyses of the physical problems have exerted was, probably, due in part to the perspicacity of his formulations which he carried into the finest details, and in part also to his constant contact with the realm of spiritual and productive processes which have not been formulated rationally as such. Indeed, Pauli went very early all the way along the well-known rationalism-inspired skepticism until he consequently arrived at skepticism about skepticism. Then he attempted to trace the elements of the process of knowledge which precede rational penetration.

Two papers in particular furnish us with the essentials of Pauli's philosophical attitude: A treatise on the influence of archetypal ideas on the formulation of natural science theories in Kepler[1] and a lecture on science and thought in the Western world.[2] We shall attempt to draw a picture of Pauli's philosophical position from these two testimonials and from statements in letters and elsewhere.

As a first and pivotal problem of philosophical reflection, Pauli recognized the process of knowledge itself, especially knowledge of nature which ultimately finds its rational expression in the establishment of mathematically formulated natural laws. Pauli was not satisfied with the concept of pure empiricism according to which the natural laws may solely be derived from the matter of experience. Rather, he concurred with those who "emphasize the role of the direction of attention and intuition in the concepts and ideas which, in general,

transcend by far mere experience, but are necessary for establishing a system of natural laws (i.e., a scientific theory)." He thus sought a connection between the perception of the senses on the one hand, and concepts on the other: "All rigorous thinkers arrived at the conclusion that pure logic is, in principle, incapable of constructing such a connection. The most satisfactory procedure seems to be to introduce in this place the postulate of a cosmic order removed from human arbitrariness, an order which differs from the world of appearance. Whether we speak of a 'participation of the things of nature in the ideas' or of a 'behavior of metaphysical, i.e., real things in themselves,' the relation between sensuous perception and idea remains as the consequence of the fact that the psyche as well as that which is known in perception are subject to an order we think of as objective."

The bridge which leads from the material of experience, which at first is in a state of lack of order, to the ideas, Pauli discerns in certain primary images pre-existing in the psyche, the archetypes as they have been discussed by Kepler and even in modern psychology. These primary images —Pauli here follows to a large extent the thoughts of C. G. Jung—should not be looked for in consciousness or related to certain ideas which may be formulated rationally. We are concerned, rather, with the forms of the unconscious realms of the human psyche, with images of a strongly emotional content, which are not being thought out but are seen, as it were, while we paint them. The feeling of joy at becoming aware of a new knowledge arises from the fact that such pre-existing primary images are in process of achieving congruity with or coincidence with the behavior of external objects.

As is well-known, this view concerning the knowledge of nature goes back essentially to Plato and has penetrated Christian thinking by way of Neoplatonism (Plotinus, Proclus). Pauli attempts to make it clear by demonstrating that even in Kepler's acknowledgment of the Copernican theory which forms the beginning of modern natural science, certain primary images, archetypes, were decisively present. He quotes from Kepler's *Mysterium Cosmographicum* this sentence: "The likeness of the triune God is contained in the sphere, that is to say, of the Father in the center, of the Son in the surface, and of the Holy Ghost in the symmetry of the relation between point and interstice or circumference." The movement from center to surface is, for Kepler, the symbol of creation. This symbol which is most intimately connected with the Holy Trinity and which is designated by C. G. Jung as *mandala*, is, for Kepler, imperfectly realized in the corporeal world: The sun at the center of the planetary system is orbited by the heavenly bodies which were yet thought of by Kepler as animated. Pauli believes that the persuasive power of the Copernican system, in the case of Kepler, was due primarily to the correspondence with the mentioned symbol and only secondarily to the matter of experience.

More than that, Pauli thinks that Kepler's symbol in very general terms stands for the attitude out of which today's natural science grew. "It seems that the psyche moves in the sense of an extraversion from an inner center towards the outside, the corporeal world, in which all events are automatic by presupposition so that the spirit at rest embraces, as it were, this corporeal world with its ideas." We are thus dealing with a Christian development of the "lucid mysticism" of a Plato in the natural science of the present day. We are looking for the unitary ground of spirit and matter in the primary images, and in this Platonic mysticism the understanding has found a proper place in its different degrees and kinds of knowledge up to the recognition of the truth of salvation. However, Pauli adds by way of a warning: "This mysticism is so lucid that it sees beyond many dark areas, a thing we, today, neither ought to nor can do."

Thus he contrasts the basic position of Kepler with that of his contemporary, the English physician Fludd, with whom Kepler was engaged in a violent polemics over the application of mathematics to experience refined by quantitative measurements. Fludd here turned out to be a representative of an archaic, magical description of nature as it was engaged in by medieval alchemy and the secret societies that developed from it.

The further development of Plato's thought led in Neoplatonism and in Christianity to the characterization of matter as absence of ideas and its identification with evil, since the intelligible was considered identical with the Good. The World Soul, however, was finally replaced in modern natural science by the abstract mathematical law of nature. With respect to this one-sided spiritualizing tendency, alchemical philosophy, represented in this case by Fludd, offered a certain counterweight. According to the alchemical view "a spirit dwells in matter who waits for his salvation. The alchemical experimenter is always drawn into the course of nature suchwise that the real or imagined chemical processes in the retort are mystically identified with the psychical processes taking place within himself and are designated by the same terms. The salvation of matter by man who transforms it—the salvation which culminates in the production of the Philosopher's Stone—is, in the alchemical conception, in consequence of the mystical correspondence of macrocosm and microcosm, identical with the transformation which spells the salvation of man, a transformation by the *Opus* which is effected only *Deo concedente*." For this magical view of nature the predominant symbol is the number four, the so-called tetractys of the Pythagoreans which is constructed by means of two polarities. Division is attributed to the dark side of the world (matter, the devil), and the magical conception of nature encompasses even this dark realm.

None of these two lines of development which took their rise, on the one hand, with Plato and the Christian philosophy, and medieval alchemy on the other, could later es-

cape disintegration into opposite thought systems. Platonic thought, which was originally directed towards the unity of matter and spirit, eventually led to a cleavage into the scientific and religious world image, while the spiritual movement determined by gnosis and alchemy brought forth, on the one hand, scientific chemistry and, on the other, religious mysticism dissociated once again from the material process (e.g., Jakob Boehme).

Pauli recognizes these divergent spiritual lines of development—which, nevertheless, belong together—as complementary relationships which have determined occidental thought and which to us moderns are more easily intelligible than to earlier epochs, since the logical possibility of such relationships has become perspicacious through quantum mechanics. In thinking scientifically, as is characteristic in a special manner of the Western world, the psyche turns outward; it asks for the why. "Why does the One mirror itself in the Many; what is the thing mirroring, and what is the mirrored; why did not the One remain alone?"

Contrariwise, mysticism, which is at home equally in the East as in the West, attempts to experience the unity of things in that it tries to expose multiplicity as illusion. The endeavor to know scientifically has led in the 19th century to the limiting conception of an objective material world independent of all observation. At the terminal point of mystical experience we have as limiting condition the soul, completely dissociated from all objects and united with the deity. Between both limiting ideas the thought of the West stretches, as it were, according to Pauli. "In the soul of man both attitudes will dwell forever, and the one will ever carry the other as the germ of its opposite within itself. Thus there arises a sort of dialectical process of which we cannot know where it will lead us. I believe that, as Westerners, we must commit ourselves to this process and acknowledge the opposite pair as complementary. In that we allow the tension of the opposites to exist, we must also acknowledge that on every path of knowledge or salvation we are dependent on factors beyond our control and which the language of religion has always designated as grace."

When, in the spring of 1927, the reflections on the interpretation of quantum mechanics assumed their rational shape and Bohr coined the concept of complementarity, Pauli was one of the first physicists who, without reservation, decided in favor of the new possibility of interpretation. Pauli's philosophical position naturally corresponded to the characteristic features of this interpretation, the belonging together of "choice and sacrifice." What we mean by this is that in every experiment, in every operative interference in nature, we have the choice which side of nature we wish to make apparent, but that simultaneously with it we have to make a sacrifice, that is, relinquish other aspects of nature. In all this there was always at the center of Pauli's philosophical thinking the longing for a unified understanding of the world, a unity which could absorb the tensions of opposites, and he hailed the interpretation of the quantum theory as a new thought possibility in which, perchance, the unity could be more easily interpreted than had been the case previously. In alchemical philosophy he was captivated by the attempt to talk about material and psychical processes in the same language. Thus Pauli arrived at the thought that in the abstract region which both atomic physics and modern psychology have entered upon, such a language could once again be found. "I suspect, to be sure, that the alchemical attempt at a psychophysical common language suffered defeat only because it bore reference to a visible, concrete reality. But today we have, in physics, an invisible reality (of atomic objects) in which the observer becomes involved with a certain freedom (wherein he is put before the alternative 'choice and sacrifice'). In the psychology of the unconscious we have processes which cannot always be attributed unambiguously to a certain subject. Now, the attempt at a psycho-physical monism appears to me essentially more fruitful if the common language has reference to a deeper, invisible reality. That language is, of course, not yet known, and would be psycho-physically neutral with respect to the pair of opposites. We would then discover a mode of expression for the unity of all being transcending the causality of classical physics in the sense of a correspondence (Bohr). The psycho-physical connections and the correspondence of the *a priori* instinctive forms of ideation with the external perceptions would be special cases of this mode of expression. In this conception the traditional ontology and metaphysics would become the sacrifice, while the choice would fall on the unity of being."

Of special studies in which Pauli was stimulated by the philosophical treatises just discussed, principally those on the symbolism of the alchemists have left lasting traces which may be recognized on occasion in opinions expressed in his letters. For instance, in the theory of elementary particles he waxes enthusiastic over the different four-term symmetries interlaced with each other, which he immediately relates to the tetractys of the Pythagoreans. Again, he writes: "Bipartition and reduction in symmetry, that is the core of the matter *(des Pudels Kern)*. Bipartition is a very old attribute of the devil (the word doubt is supposed to have meant originally division into two)."

Pauli was less close in thought to the philosophical systems dating from the time after the Cartesian cleavage. Kant's employment of the concept *"a priori"* he criticizes in most definite terms, since Kant used this technical expression for forms of intuition or forms of thought which are capable of rational fixation. He warned expressly that "one should never explain theses established by rational formulation as the only possible presuppositions of human reason." The *a priori* elements of natural science, however, Pauli relates most intimately to the primary images, the archetypes of Jung's psychology which do not necessarily have to be understood as innate, but which may be con-

ceived as slow variables and relative to a given knowledge situation. In this respect, therefore, Pauli's and C. G. Jung's concept is different from that of Plato, who looked upon the primary images as unchangeable and existing independently of the human soul. At any rate, these archetypes are, however, the consequences or witnesses of a general order of the cosmos which comprises matter and spirit equally.

In view of this unitary order of the cosmos which, for the present, may not be formulated rationally, Pauli is skeptical also about the Darwinian conception so widely held in modern biology, according to which the evolution of the species on earth is supposed to have originated solely by accidental mutations and their effects in conformity with the laws of physics and chemistry. He feels that this schematism is too narrow and thinks that more general connections are possible, which can neither be incorporated into the general conceptual schematism of causal structures nor described correctly by the concept "chance." Again and again we meet in Pauli the endeavor to leave the modes of thinking we are used to in order to approach the understanding of the uniform structure of the world along new paths.

Moreover, we need not mention that Pauli had to enter again and again the debate with himself regarding the concept of God while struggling for a correct understanding of the "One," and if he writes in a letter of the "theologians with respect to whom I stand in the archetypal relation of hostile brothers," this remark surely was likewise meant in earnest.

As little as he was capable of simply living and thinking in the tradition of one of the old religions, so little was he prepared to align himself with an atheism founded naively on rationalism. Perhaps one cannot present Pauli's attitude in these very general problems any better than he himself has done in the concluding paragraph of his lecture on science and thinking in the Western world: "However, for the person to whom narrow rationalism has lost its convincing power, and the magic of a mystical attitude which experiences the external world in its oppressive manifoldness as illusory is not effective enough, for such a person, I believe, nothing remains but to expose himself to these contrasts and their conflicts, in one way or another. It is just for that reason that the investigator can, more or less consciously, pursue an inner path of salvation. Then there arise, slowly, compensatory to the external conditions, inner images, imaginings or ideas which show that an approximation of the poles of the pair of opposites is possible. Having been warned by the failure of all premature endeavors in the history of the humanities toward unity, I do not intend to venture predictions as to the future. But, contrary to the strict division of the activity of the human mind into separate compartments, fashionable since the 17th century, I consider the ideal goal of surmounting the opposites, to which also the synthesis which emphasizes rational understanding as well as the mystical experience of unity belongs, as the mythos of our modern times, be it plainly stated or tacitly held."

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CARL FRIEDRICH VON WEIZSÄCKER

Platonic Natural Science in the Course of History

TRANSLATED BY RENÉE WEBER

TWENTIETH CENTURY PHYSICS IS EXHIBITING SOME ESSENTIAL FEATURES OF PLATONIC THOUGHT

THE SUBJECT I have chosen is comprehensive, and therefore cannot have the virtue of great brevity. Accordingly, it will be divided into five parts: I shall begin with the 20th century, pass over the 17th, and then to Plato himself, whence I will quickly turn back to the 17th century, and finally return to the 20th century once again, but somewhat more explicitly.

I

Werner Heisenberg, in his book of memoirs, *Der Teil und das Ganze* (*Beyond Physics*), describes how, as a *gymnasiast*[1] in Munich in 1919, when lying on the roof of the Theological Seminary across from the University in the Ludwigstrasse, he read Plato's *Timaeus* in the original. He did so in order to practice his Greek for the imminent *Abitur*,[2] but in addition, he specifically read this work because it contained Plato's natural science, and this interested him. He describes how astonished he was to find that Plato affirmed that there were some sort of smallest particles of matter (which we would perhaps call atoms)—regular polyhedra, tetrahedra, octahedra, cubes, icosahedra (only the dodecahedron was missing)—and he asked himself what sense there might be in conceiving these mathematical figures to be the ultimate building blocks of fire, water, air, earth—in short, what we call the elements. Reading through Heisenberg's book, one finds observations concerning the relationship between his own physical theories, which he had in the meantime developed, and these Platonic concepts. Heisenberg confesses, in that work, that his development of the present-day theory of elementary particles is in fact Platonic natural science, that is, natural science in Plato's sense. Thus one can say that the greatest living theoretical physicist conceives his work to be science in the tradition of Plato. As a matter of fact, I could reduce this entire lecture to the formula: In what sense can contemporary science be viewed as Platonic?

First, let me say a few words about Heisenberg's book, which I have just been paraphrasing. I find this book Platonic in its habitus. In fact, it contains the only genuinely Platonic dialogues of recent times that I know of. In these dialogues the environment comes alive, and the participating persons come alive. Just as in the case of Plato, the people who take part in the dialogues are there —people who really lived, who in part still live today, and, as in Plato himself, they are characterized by what they say; at the same time, intellectually opposed positions become clear. I believe that I do my teacher and friend Heisenberg no injustice, however, when I say that the precision and compactness of philosophical thinking in the Platonic dialogues still surpass what happens in Heisenberg's dialogues, and that the level of philosophical contemplation in Plato is still higher. Of course, I hardly know of a single work in the whole of world literature about which I would not say the same thing. On the other hand, Heisenberg's dialogues also have an advantage over those of Plato. In Plato, Socrates or whoever is at the time speaking for Plato (the Eleatic Stranger, the Athenian, the Pythagorean Timaeus) is always right in the end. But in Heisenberg, someone else is occasionally right in the end, and that is very pleasant. Now to the content:

Heisenberg's thesis lends itself to clear formulation. When Plato maintains that the ultimate building blocks of fire are tetrahedra, the ultimate building blocks of earth are cubes, and so on, he makes use of the "Platonic solids," which were not discovered by Plato but which are today often named for him. These solids have a mathematical property, namely, the mathematical property of representing the symmetry of three-dimensional space in discrete form. They are geometrical representations of the symmetry groups of space—the rotations that space permits. All of these solids have the property such that there are certain rotational operations which transfer their angles into other angles such that the body as a whole subsequently fills up the same space that it did before. They are in this sense regular solids; they are the representations of symmetry groups. Heisenberg believes that in the final analysis contemporary physics must be built on the assumption that the fundamental laws of Nature are symmetrical and invariant with respect to the applications of certain symmetry groups—groups, to be sure, which contain additions to those that Plato considered. That is to say, Heisenberg believes that the selfsame symmetry which was for Plato a basic principle of natural science is also a basic principle of natural science for contemporary physics. But in the latter it appears in a mathematically more developed way—in fact, in such a way that what we regard as a fundamental law is no longer the existence of certain ultimate bodies, but rather certain differential equations which specify the law of change of the possible states of objects. It is of course clear to Heisenberg that this brings about a difference vis-à-vis Plato; Heisenberg is also certain that in this respect we have an advance over Plato. The progress of science is not denied. But Heisenberg believes that a principle is being referred to here that was presumably first formulated by Plato—unless Plato had Pythagorean predecessors in this concept. (This, however, is a question that, historically speaking, is very difficult to explore, and I want to remain with Plato.) And so to Heisenberg's view.

The question now arises, does that view really mean anything, and if so, what? In the case of Heisenberg, it has a decidedly aesthetic tone. Heisenberg explicitly acknowledges that the laws of Nature are beautiful, and that symmetries are a form in which the beauty of the regularities of Nature can be conceptually grasped and conceptually reflected. And it cannot be doubted that for Plato, as well, the Beautiful stands in one of the highest places and constitutes one of the highest values. On the other hand, we could ask: Is this recourse to the Beautiful intellectually demonstrable? Is there something more involved here than just the impression of a lively, artistic feeling of a scientist? I believe that if we are to pursue this question (and it is this philosophical question that interests me), then we must first of all ask: Can it be that we do not have a fully satisfying theory of science, one that properly explains why such mathematical regularities are valid? I believe that Heisenberg's essential point is that we do not have that kind of scientific theory today. Recourse to Plato is needed precisely because the undeniably non-Platonic views that in general prevail in contemporary theory of science do not account for the essential phenomenon that is at stake. This phenomenon, crudely stated, is first of all the validity of mathematical laws, or more precisely, just those laws about which I have already spoken—certain symmetry laws. In general, we have today a more or less empirical theory of science which without doubt correctly represents one feature of science, namely, that our science was discovered by virtue of experience, and requires the evidence of experience if we are to believe in it. As a check on the truth of our assertions, and as an incentive for their development, we need conceptually ordered sense experience. Not even Plato disputed this thesis. On the other hand, Heisenberg alludes to the fact that the bare datum of experience, in the sense we normally know and recognize it, does not make clear why there should be very simple basic laws—laws that we can describe with a couple of simple mathematical concepts in spite of the fact that they determine an immense profusion of particular experiences. Why are the laws (if indeed they exist at all) not as complex as the particular experiences?

What is at stake here is something that cannot be grasped methodologically, since various sciences which use the same method make, at this point, quite different

discoveries. For example, weather is complicated, and every attempt to turn meteorology into a simple science fails. But once the clouds have blown away from the sky and we see the stars, we find the object of another science, astronomy—and in astronomy there are quite simple mathematical regularities of motion, as Kepler discovered in the 17th Century. In spite of this, the basic physical laws of meteorology and of astronomy are the same. However, there are complicated phenomena and there are simple phenomena, and this difference cannot be explained away methodologically.

One cannot imagine that there might be a science for which meteorology would be simple and the theory of planetary motions complicated. Consequently this means that the discovery of simplicity is a genuine discovery and not merely a methodological measure, not merely a means of thought-economy. What is it that is being discovered, when it turns out that if we get down into the atoms, the basic laws are really simple? This is the question that Heisenberg asks, and I believe that one can say in all good conscience that the theory of science of our century knows no answer to it. The question now becomes: Does Heisenberg, does Plato, does anyone else know an answer to it?

II

I shall now turn to those suppositions, and perhaps answers, to this question that were formulated in the 17th century. I go back to the 17th century because it was then that the science was begun which today has come into flower, and which the 20th century may perhaps bring close to its consummation (at least in physics). I speak in particular of Kepler.

Somewhere around the beginning of the 17th century, Galileo argued that Nature, God's second book (the first being the book of salvation, the Bible) is written in mathematical letters, and whoever hopes to read this book must first learn the alphabet of mathematics. With this proposition, Galileo turns away from the traditional philosophy of that time, which is based on Aristotle, and leans on another authority, namely, Plato and Pythagoras. Galileo argues from the viewpoint of Plato's mathematical science against the qualitative science of Aristotle, and from the viewpoint of Plato's structural science as opposed to Aristotle's descriptive science. In the modern myths about science, these relationships were turned upside down, and it was believed—completely against the truth of the matter—that Galileo argued from an empirical science against a purely speculative science, as it was termed. To be sure, he did argue for experience, but it was an experience illumined by mathematical constructs—not for the description of what is visible, but rather for the design of experiments and the production of phenomena that one does not normally see, and their prior calculation on the basis of mathematical theory.

I do not want to describe this in detail here, for this would require me to show in what sense Galileo's Law of Inertia or Law of Gravity describe something mathematical that was not observed in this particular form and that certainly cannot be observed with any exactitude. I would also have to show that Galileo saw the merit of his science precisely in his construction of a pure, abstract, mathematical model by means of which he was able to distinguish the essential from the non-essential, among natural phenomena, thereby rendering even the non-essential (i.e., the deviation from this mathematical law) accessible to further mathematical analysis. For example, if the law of gravity, as he depicts it, were to hold good nowhere but in the vacuum which he did not know empirically, but which he postulated, then the deviations of the real law of gravity from the law of gravity as it applies in a vacuum become, in their turn, accessible to mathematical analysis —an analysis of the forces of resistance and friction.

Thus Galileo believes in the amenability of natural phenomena to mathematical formulation, but he does not prove it. He establishes it only through his success. The question now is whether one can make this mathematicability which Galileo postulates comprehensible, for it is not self-evident. For this, Galileo provided theological formulae from time to time. Earlier, I spoke of the "Book of Nature"; this is a metaphor. The same theology on which Galileo touched lightly was rigorously thought through by his contemporary, Kepler, and I should now like to say a few words about how Kepler viewed these matters.

One must say immediately that Kepler advanced the mathematico-empirical science of modern times in certain ways that surpassed Galileo's achievement. We recall that Kepler wrested his first law of planetary motion from the old view that heavenly motions must necessarily take place in circles. The method he used was a mathematical description, made with the greatest possible precision, of the observations of Tycho Brahe concerning the orbits of the planets. He determined that every combination of portions of circles which the motion of the planet Mars supposedly represented approached the actually observed motion with an error of only eight arc-minutes—and eight arc-minutes are very few, being about a quarter of the diameter of the full moon. Now, one could say that whether Mars is located where the calculation of its orbit says it is, or a quarter of a full-moon's width away, is surely a matter of complete indifference to us. But it was not a matter of indifference to Kepler, and because of this error he gave up circular orbits and dared to introduce the unheard-of idea of the elliptical orbit, a less than perfect curve. This was daring enough, for one believed in the perfection of celestial motions. But with the ellipse he was able to bring about an exact agreement between observation and calculation, and on the basis of this empirical test he accepted the new law. Kepler's thinking was

thus empirical in the sense of the greatest possible mathematical exactness, i.e. he believed that experience admits of a strict mathematical analysis.

Now the question arises, why should this be? Kepler's answer is frankly theological. I sketch it briefly here, as it is presented in his work about world harmony: God created the world in accordance with His Ideas of Creation. These Ideas of Creation are the pure archetypal forms that Plato termed ideas, and the kind of archetypal forms which are relevant for us are mathematical forms: number and figure. These are the divine Ideas of Creation, for they are pure forms, in accordance with which God created the world. Man was created in God's image —not in accordance with the physical image of God, for God is non-physical, but in accordance with the spiritual image of God. This means that man is capable of thinking about God's Ideas of Creation. Such reflection on the divine Ideas of Creation is what physics is: physics is divine service, and as divine service it is true.

This, briefly summarized, is the Keplerian philosophy. It seeks to found the empirical fact of the success of mathematics in natural science through recourse to the sole factor which, Kepler was convinced, can explain this whole business: God's act of Creation in its dual aspect, the creation of nature, and the creation of man who can know and understand nature. Ten or more years ago I spoke and wrote repeatedly about these questions, and at that time I stressed the Christian component in this doctrine. Today I would not retract these earlier statements, but I must say that during the past ten years I have read much more Plato than I did previously, and I have learned to what extent Kepler's view is really not Christian but Platonic—or else Christian insofar as it is Platonic, for historical Christianity is broadly Platonic in its theology. The question is, of course, whether it is Platonism on the highest level, and to this I would have to say that it is not quite that. Neither Heisenberg nor Galileo nor Kepler has taken Plato's entire philosophical thinking into full consideration.

III

I now come to the third part of this discourse, in which I shall try to indicate how, according to my understanding, this context may have appeared in Plato himself. I must confess at the outset to the deficiency of what I expound, for in order truly to present how natural science is related to Platonic philosophy I would have to develop Plato's entire philosophy. Indeed, it would not be philosophy if it did not have the property that each single thought, queried as to its content, requires going through the whole of that philosophy for its answer. Thus, when I speak about Plato's natural philosophy, I cannot mention it in passing without touching on Plato's metaphysics, Plato's political philosophy, Plato's doctrine of artistic beauty, and everything else that is to be found in Plato. Since this is not possible, I can only give a few indications. I must state, furthermore, that what I am saying is in part a reconstruction of Plato's doctrine which is hinted at but not worked out. There are, for example, his remarks in the *Seventh Letter*, and there is also the famous dispute about Plato's "unwritten doctrine." My interpretation must be given here without submitting particular evidence. Moreover, I know that I do not do full justice to Plato, for there are areas in his work that I have not yet understood but which I am convinced Plato knew exactly what he was talking about. Principally, I want to stay with the ideas from the *Timaeus*, because the *Timaeus*, as matters stand, is the representation that Plato gave to his picture of nature, to his natural science.

This dialogue begins with a totally puzzling pleasantry: "One, two, three, but where is the fourth?" says Socrates; he means that there are three discussants and that the fourth is not yet here. And yet, if one knows Plato one will say that this remark quite certainly alludes to something more. C. G. Jung allowed himself to be stimulated to great fantasies by this opening of the Platonic dialogue, since for Jung quarternity was a fundamental psychological phenomenon, and one's forgetting "fours" and only registering "threes" was also a fundamental phenomenon.

But did Plato in fact mean that? I would say that he certainly did allude to a quadrupleness, about which I will speak later, and which is perhaps hinted at in the image of the Divided Line of *The Republic*. But of this I am not sure; I merely say that in the first sentence one perceives that mysteries are being played with, whose full disclosure was obviously not the intention of the author. If one reads on, he discovers that the partners in the dialogue are discussing Socrates' references to the dialogue transmitted to us as *The Republic*. To be sure, Socrates only recounts the first half. Some philologists have believed that this showed that Plato had at that time written and intellectually mastered only the first half of *The Republic*. But that certainly was not the case. I would much sooner believe that in this passage, by means of a literary device familiar to him, Plato wants to point to the fact that one must have read the first half of *The Republic* in order to arrive at that systematic point at which the *Timaeus* begins: that there exists a state in which a class of guardians rules by virtue of a knowledge they have acquired. Insofar as this knowledge—which in part can arise only through a divine spark—can be prepared for through acquired learning, such preparation can be done by means of mathematics and mathematical science. The Seventh Book of *The Republic* states that this is the case. I would interpret this passage to mean that the *Timaeus* is the exposition of that doctrine to which the Seventh Book of *The Republic* merely referred, but which one must have studied if one wants to rule a state well. To rule politically, one must have learned astronomy. Naturally this was as flabber-

gasting to Plato's readers as it is to us. Why should this be the case? It can only be so because the basic structures of reality manifest themselves in astronomy and in physics (elementary particle physics, as we might say), and it is towards these that he who would be capable of grasping those more intricate structures of reality manifest in political life must turn his eyes. With this, I shall leave the connection with politics, and deal only with the central doctrine itself.

This doctrine, then, is expounded by the Pythagorean Timaeus, a man who otherwise plays no part in Plato, and about whom we know next to nothing. It is he who is given its exposition, for it is clear that Socrates, the moral philosopher, the political thinker, the religious thinker, knew nothing about it. Thus it is Timaeus who expounds the doctrine, in a cohesive, solemn speech. He starts with a distinction which we must continually call to mind: the difference between that which always is, never becomes and never perishes, and that which never is, always becomes, and perishes. This distinction, with which the *Timaeus* opens, is a reminder of what must long have been familiar to the reader of this dialogue, namely, the Theory of Ideas. That is to say, natural science can be understood only on the basis of the Theory of Ideas, as I shall try to show.

We must therefore ask ourselves, what is the Theory of Ideas? And we must also ask ourselves, what is its role in natural science? Now the Theory of Ideas is introduced in the *Phaedo* by way of an example, the idea of equality. Two pieces of wood (or the two proverbial pieces of paper that figure in examinations) are equal. But of course they are not really exactly equal. Indeed they are always most definitely unequal. But how can I say that they are unequal if I do not already know that equality exists? On the other hand, how in the world can I know that equality exists, since everything that is given to me sensibly is always unequal, and thus equality is never to be found empirically? Here the Myth of Anamnesis (Recollection) is invoked: Prior to my sensible experience, prior to life in this body, the soul at one time gazed upon equality itself, and recollects this through the very things that are not truly equal, but only participate in equality. This participation is the essence of the sensible, which arises and perishes. Equality itself, however, is always the same, is unchangeable, is always selfsame; that is the "form" of equality—in Greek, "idea."

This classical, familiar train of thought of Plato must be interpreted by us if we want to see its relevance for natural science. One interpretation that suggests itself is related to the representation of mathematical forms. In former lectures I have often drawn a circle on the blackboard and said: This circle is perhaps very beautiful, but nevertheless it is not a real circle; mathematics speaks about the circle itself and not about these empirical, ostensible circles. If natural science is mathematical, it follows mathematics, which describes the objects that we perceive sensibly in terms of those mathematical forms in which they participate. Consequently, objects can be grasped by means of an understanding of the mathematical forms—ergo, a circle on the blackboard, the motions of the stars in the sky. But this having been said, nothing more than a problem has been formulated. For what does it mean to participate in *methexis*, in Plato? What does it mean to say that I have a form that is a circle and yet not a circle, but rather participates in the form of a circle? Do we understand what we mean by this?

Let me give a second example. In the Tenth Book of *The Republic*, Plato introduces the idea of *things*, for example, the ideas of beds or of bridle and reins (perhaps to the alarm of some who thought they had understood the Theory of Ideas). I remind you of the construction that he offers. First, he brings up the idea of the *Kline* (the couch on which one lies during Greek meals), and says that there are three such couches: the one that God made, the many that the artisans make, and in addition the pictures of couches that artists paint. (The whole thing is said in connection with his criticism of poets and painters, but I shall omit this aspect.) The many couches that the artisans make are copies of the one sole couch that God has made. That is the *Kline* in heaven. And in like manner pictures only resemble couches, and are in their turn but copies of the couches that artisans make. Exactly the same holds true for bridle and reins. The one horse's bridle that actually exists in nature, in *physis*, is known to the rider. The many horses's bridles that exist are actually fabricated by the harness-maker. In addition, there are painters who portray this in paint. Again I shall leave the painters aside and determine that the artisans are in both cases considered to do the same thing, but that in these two cases something different appears on the topmost rung: God, who made the couch, and the rider, who has knowledge of the horse's bridle.

Since the parallelism of this passage is complete in other respects, one must conclude that the rider *knows* what God has made. Adding an interpretation, I conclude that this text claims that we must take seriously the fact that the rider knows what God has made. Let us stay first of all with the rider, and let us say that the discussion about God may well be metaphorical in Plato. Perhaps it is a mode of expressing in the language of popular religion a difficult philosophical idea. But what, once more, does the rider know? He is able to tell the saddle-maker how a horse's bridle must be made in order that it may work well. That is to say, the rider knows the function of the horse's bridle; he knows its task. He knows the relationship between horse and man that makes possible man's being able to lead or to ride a horse at all—and this he does with the help of the bridle. This relationship is a genuine one. It is, however, no material thing. It is something that one can understand if one comprehends the re-

lationships of function, the relationships of laws in the world. And if one says that this world is made by God, then one can indeed say that God made the one true horse's bridle, namely, that lawful relationship which makes it possible for a man, with the help of a horse's bridle, to ride a horse.

I want to put this same idea into a modern setting by citing a contemporary writer, Konrad Lorenz, who has written about the Greylag goose (*Anser anser*) in his book, *On Aggression*. In it he writes that the Greylag which is described by the zoologist or the ethologist—the behavioral researcher—is a creature that exists nowhere, just as the perfect circle exists nowhere. Lorenz holds that the Greylag goose described by ethology and zoology is that creature which optimally fulfills the ecological niche of the Greylag—in other words, the conditions essential for its life. Real Greylags, however, always differ from this model. Repeating what Lorenz says in this connection, we know the Greylag goose is monogamous; this feature even seems to be optimal for its mode of life. But when Lorenz and his co-worker reviewed the many Greylag biographies that had been observed, Lorenz determined that his Greylags did not in fact always live entirely monogamously. And he became angry about this. (It's quite characteristic of him to have become angry about it.) Then his co-worker told him that he surely shouldn't get angry about such a thing, for Greylags are after all only human. Well, "they are only human" means that they only have a *methexis* in the real Greylag goose, which the zoologist describes; she is indeed monogamous, but she doesn't exist.

However, empirical Greylag geese, which do exist,[3] are possible only because the pure form of the Greylag exists in another sense, namely, as that very law which describes the optimal functioning of the Greylag goose. And Lorenz is a Darwinist. According to Darwin, that Greylag which will ever and again prevail in the struggle for being is the very one that is optimally adapted to those conditions of which only the zoologist is aware (of which no Greylag is aware), and without which there would be no Greylag geese. That is to say, Lorenz has the beautiful notion that the realization of the Platonic idea in modern science takes place by virtue of the fact that everything happens quite scientifically—in the manner, for example, that Darwin describes. There is, in fact, no opposition between Plato and Darwin. To be sure, Lorenz did not quite dare to speak as Platonically as I do here. I once had a talk with him in which I said that I would like to give him the courage to say this, for after all, this is Platonism—not exactly what is in the dialogues, but, I believe, in harmony with them.

But having come to this point, we have only formulated the problem anew. Plato undoubtedly dealt with tables and horse's bridles and geese, but he particularly asked the question which, in contemporary science, also worries the physicist: To what extent are Greylag geese possible? What, essentially, are the basic regularities that must be assumed if one speaks as these zoologists do? It is precisely when one produces nice materialistic natural science, and stays entirely faithful to matter and its laws, that one arrives at Plato. On the other hand, if one attempts too quick a leap into the spiritual realm, one does not get to Plato. The Greylag goose, according to the natural scientist, is composed of molecules and these are in turn composed of atoms. The atoms are satisfied by the laws of quantum mechanics, and these are the proper laws of modern elementary particle physics.

What in Plato corresponds to all this? First, that the basic laws of nature are mathematical. But why should they be mathematical? With this point we are brought back to the question: How is it that in nature—in what we term physical reality—things like circles, that participate in the form of circularity itself as described by mathematics, can exist. With this question we have arrived at the gateway to the outer courtyard of the Theory of Ideas, for everything that has been said up to now was of course only an application of the concept "Idea" in order to describe a few phenomena.

I want to characterize the step that must here be taken systematically, in the most appropriate terms. Towards this end, I say that I have drawn a circle on the board and have asked, "What is this?" And the answer was, "A circle." Well, it is perhaps not a good circle that I have drawn, but then, what is a circle? I pose the question in this vein in order that we may grasp in a general sense to what extent it is a circle, and to what extent it is not. Then I say, "The circle is that geometrical locus of points which are equidistant from a given point on a plane." Now I have given a mathematical definition. The circle, accordingly, is a mathematical form or configuration (Gestalt). Plato calls this form an Idea. But the mathematical forms are not the highest Ideas. (There is a Platonic terminology according to which *mathematica* are not yet true Ideas; I shall ignore these distinctions for the moment.) A circle, therefore, is an Idea. Recapitulating, I ask: What is that? A circle. What is a circle? An Idea. But what is an Idea? Well, how have we proceeded up to now? We took off by means of the retrospective question: "What was that?" from an apparent multiplicity of lowly organized entities to the next highest level. The explanation always came about by virtue of what in logic we would term a meta-concept. Of course this does not suffice as a characterization. For what, then, is that meta-concept by means of which we are able to determine what an Idea is? If we were to say, "An Idea is such and such," and in so doing were to point to something, we would have missed the entire point of the argument. For then we would have been explaining the explanatory principle in terms of that which is supposed to be explained with the help of this principle. The answer to the

question, "What is an Idea?" must consist in the very least in the attempt to characterize what properties Ideas may be said to possess, in the same way that I earlier characterized the circle by means of a mathematical definition. What are the properties of an Idea? In the middle of the *Republic*, Plato says that the Idea is one as compared with its multiple manifestations—just as in Book Ten of that work he says that God made the *one* couch. Using the singular, the zoologist asserts that the Greylag goose is *one*. Here the coherence, in accordance with the theoretical principle that is in question, is one. The Idea, consequently, is *one*.

The Idea is *good*. The circle which the mathematician describes is a good, a *true* circle, in constrast to the poor circles which we draw by hand. The Idea *is*; it is real. In denominating what an entity is, I am describing its Idea. Thus I am describing its being by means of its Idea. The Ideas, thus, are characterized in terms of being, in contradistinction to arising and perishing.

The Idea is *intelligible*. In fact, it is the only entity that can be understood, and in this sense it is "unconcealedness," as Heidegger translates the word so well. It is *alethia* (not-concealed, truth); it is true. The word "true" in contemporary linguistic usage refers only to sentences, and not to *gestalten*. For this reason, "unconcealed" is a better translation than "true." If I want to understand something about this figure that I am drawing on the board and calling "circle," I can understand it *only to the extent that* I term it "circle." In other words, I understand its Idea. The varying instances of the Idea are difficult to grasp. I could say, they are molecules of chalk. Yes, chalk, to be sure; but what is chalk? Again, this is a conceptualization, and if I want to express it precisely I shall perhaps arrive at something like the Idea of the chalk. Thus it is always the Idea which I understand. And that is the essence of the Idea. I have characterized Ideas by means of the transcendental qualities: One, Good, True, possessing Being. These are the classical transcendental qualities as they are found in Plato's *Republic*.

The question that has led us to where we now stand points beyond the Idea, to the One. The *Republic* asserts that, just as the sun gives being and light, being and visibility, to plants and animals, so surely does the Idea of the Good which is presented as the highest *mathema*, the highest model, give to all existents (i.e. to the Ideas) Being and visibility—*on* (actuality) and *alethia* (unconcealedness)—as their properties. The Platonic dialogues, of course, do not state explicitly that the Good under discussion is the same as the One, but Aristotle has conveyed this interpretation to us, and I believe we can accept it. It follows that the transcendental qualities are connected to one another in a not easily discernable relationship which I shall characterize as the One, *to hen*, Being-One. The Platonic Theory of Ideas, if it can be realized at all, is realized in the Doctrine of the One. But what is the One? Well, to reduce the One yet further is obviously a hopeless venture. In such case it would not be the One, but rather a second or third. I cannot here present Plato's philosophy of the One as it is set forth in the *Parmenides*, despite the fact that only in this way could I not merely enter the courtyard but perhaps pass through the door to the sanctuary of the temple of Plato's thought. Only at that point does the Theory of Ideas truly begin. Aristotle has told us that Plato held to two principles. The name of the first principle was said to be *to hen*, the One; the other had various names—the "large-and-small," or the "indeterminate duality," or even, perhaps, the "continuum." Plato was said to have used these two principles in order to produce the Ideas and everything that participates in the Ideas.

If, having followed the train of thought that I have been presenting, we now ask how this last can be possible, then we must indeed wonder how there can be one *principle*, if it is more than the One? The reduction necessarily leads to the One, and ends there. But how can there possibly be two principles in a philosophy that is as rigorously constructed as Plato's? On the other hand, how can a single principle be derived from anything like the multiplicity in which we live and move? One way to interpret Plato's *Parmenides* is to say that it exhibits this tension between the unity of this principle, and the multiplicity of principles. In addition, this dialogue tries to show that whoever so much as attempts to think of the One cannot help but think of it in terms of this movement between unity and multiplicity.

[We spoke earlier of tracing a conceptual path in Plato, an Ascent that took us from sensible particulars to their underlying abstract universals.] Returning, we proceed from the Ascent back down to the Descent, and if I understand Plato correctly, natural science is the Descent only. Politics, too, is only the Descent. In the Allegory of the Cave in the *Republic*, Plato describes how human beings are all like prisoners in a cave who, enchained, sit looking at moving shadows on the wall—shadows of objects being carried along behind them, and illumined by a flame located still further behind them. If, sitting in the cave, we do not turn around, we take the shadows to be the only reality. That appearance is the sensible world; in the domain of politics it is exemplified by victory through election and similar achievements. But let us stay with physics. If we describe what we perceive through the senses, we believe that what is so perceived are the things themselves. Of necessity, a turning about of the whole soul must take place, and we must be led up out of the cave so that for the first time we may behold the objects whose shadows we have been watching on the cave wall. When first we leave the cave our eye is painfully dazzled; it cannot apprehend real objects because it is not yet prepared for them; it can only see their shadows and reflec-

tions. Gradually, however, our eye begins to see the objects themselves in the light of the sun, and at last it may even be able to glance at the sun itself.

Plato states explicitly that the sun is the allegory for the Good; it is the appearance of the Idea of the Good. Now, once a man has climbed to that point he will always wish to see the things themselves, as they are in themselves; but he will have to return to the cave, if only for the sake of the others who remain there, in order that he may teach them to see. On this Descent, he again runs through all the stages he has passed, until he comes back to that spot where, sitting down on the self-same stool, and looking at the shadows on the wall, he sees nothing different from what all the others are seeing. But he knows; he knows what it is that he is seeing. I would say that the later philosophy of Plato is the philosophy of the Descent, the return to the cave, which explains by means of the highest principles what it is that we see in the cave.

It seems to me that it is in this context of the Descent that the doctrine developed in the *Timaeus* may be grasped. This is the doctrine to which Heisenberg has referred, concerning the polyhedra of which the physical elements consist. In a series of passages in the *Timaeus*, Plato gives unequivocal hints to the effect that he is here concealing something. He introduces a few propositions which are enigmatical yet definite, and it seems inconceivable to me that Plato meant these assertions to be anything but precise, even though he does not explain them. I gladly follow in its basic assessment, (if not in every detail) the view developed by the Tübingen School—by Krämer and Gaiser—that Plato's unwritten doctrine of which Aristotle speaks really did exist, and that an essential component of this doctrine was this mathematical schema of natural science. What Aristotle says about this, for example in *de Anima*, is of course equally enigmatic. If one considers these reports by Aristotle and a few others, one at first gets the feeling that it is a completely mixed up and incomprehensible philosophy, quite unworthy of Plato. The continuing resistance to the interpretation of the unwritten doctrine seems to me to be connected particularly with the fact that one feels obligated to protect Plato from the reproach of having constructed so inferior a philosophy. But I would like to think that this philosophy is really not inferior, but rather that it was only obscured because Plato knew that it was hypothetical, and because he sought to avoid the kind of talk that was bound to arise about hypotheses that hint symbolically at what the total context might be. This, too, is a conjecture and can be disputed, but that is how I would like to look at Plato.

What actually is the content of the theory? In *de Anima*, Aristotle says that Plato taught a four-step Descent from pure numbers [point-numbers]—which are the Ideas—to lines, from there to planes, and from there to bodies. In these four steps, the entire enumeration of what properly constitutes Nature is achieved. I would interpret this Ascent or Descent, depending which side one begins on, in the following manner. Let us examine the question: What is a body essentially? First, mathematically. Plato teaches that fire, for example, consists of tetrahedra—in other words, of certain small bodies. But what is a tetrahedron? And what is a cube? Well, both are volumes bounded by certain planes. In the case of the tetrahedron, these planes are triangles; the tetrahedron has its boundaries in the triangle. *Peras*, boundary or limit, is a Platonic term that can as a rule replace the word "Idea" wherever it is found. The Idea is what gives an entity its form—in which it participates insofar as it has a form—and in this case the form is conceived as the outline or contour. Thus the boundary of the body of tetrahedra is the *essence* or the *Idea* of such a body, and that is a certain ordering of three-sided figures, triangles. But what is a triangle? It is a two-dimensional figure, determined by its boundaries, viz the equilateral triangle through three equal lines. Consequently it is these lines which constitute the essence of the triangle. The Idea of the triangle lies in its boundary lines. But what is a line? A line is determined by a certain number of points, in this case, by two. The essence of this line is determined by the points that define it. The points themselves have no further extension. They no longer share in extension, in the large and the small, but they still have a number. What is the essence of point-configurations? It is, in the last analysis their *number*.

What I have been doing is to ascend through various dimensions from body to number, always operating with the dual concept of the thing and its essence. The essence is the Idea. I have thus been reiterating the Theory of Ideas in a three-fold way. I would like to believe that this exposition at the very least has conveyed a suggestion of what is found in the Platonic system. If this is so, one can indeed come to terms with the doctrine in the *Timaeus*. For then, of course, these tetrahedra which are so sharp (and which on that account presumably explain why fire burns, because they penetrate our skin with their points) are on the one hand an attempt to make even such physiological relationships intelligible; on the other hand, they are only the lowest rung of a system of derivations (as the Tübingen School terms it) that leads back to what constitutes the essence of fire—beyond triangles, beyond the line, to number. Number, in its turn, is that which is developed through the progression of the One—thus, in the final analysis, through two principles: the principle of the One, and the principle of unlimited duality (that is, of multiplicity).

This is an attempt to present in a symbolic way in what respect the sensible world is in fact not something that stands in opposition to the world of Ideas in a radical dualism, as has so often been taught. It is an attempt, rather, to show in what respect the sensible world is that

domain in which the Idea exhibits itself, insofar as it replicates itself in accordance with the principle of multiplicity, of unlimited dualism. In other words, it is an attempt at a deductive natural science.

If one therefore asks why mathematical laws are valid in Nature, the answer is because these are its essence; mathematics expresses the essence of Nature. In the language adopted by Kepler, this would mean that God created the world according to his Ideas of Creation, which are the pure forms. The Demiurge introduced in the *Timaeus*, the divine craftsman who makes the world, is surely the symbolic representation of this interrelationship of essences. To what extent Plato tied all this in with the doctrine of a conscious, personal being, a world-soul or world-intelligence, is a matter which he himself hid beneath the veil of his symbolic manner of expression—which I shall not attempt to rend here.

The crucial transition from the One to the Many about which I have been speaking deals, in addition, with the principle of motion. Therefore I must add a few words concerning Plato's theory of motion and time. In so doing, I am also arriving at the point at which contemporary science has learned, little by little, how it must differentiate itself from Plato. Modern science, through Galileo, started out as a theory that concerned the amenability of motion to mathematical concepts. Galileo subjected motion to mathematical operations in contrast to the mathematics of equilibrium, of statics, applied in antiquity. However, this is not a sharp distinction, for in ancient astronomy even motion was treated mathematically. How, then, does Plato conceive of motion; how does he conceive of time, in which we claim motion exists? Here I could once more observe that this question takes us to the portal of Platonic philosophy. I would like to think that Plato's later philosophy is essentially the philosophy of motion.

In the *Timaeus*, Plato offers a definition of time: It is the moving likeness of the One, of the *Aion* that, in accordance with numerical progression, abides in the One. In fact, it is the *aionic* likeness. What does *aion* mean? We translate it by the word "eternity," but according to Greek linguistic usage, it can be designated primarily as a meaningful, fulfilled span of time. It is a term that occurs without explanation in Plato. In any case, time, *chronos*, is a likeness of something else—a moving likeness of something in accordance with the principle of number. This is numerical, measurable time. Immediately thereafter, Plato speaks of the fact that the firmament was created by the Demiurge in order that time might come into being, for time is measured through the revolutions of the heavenly bodies.

The Ideas appear as motionless in Plato. In spite of this, in the *Sophist* he speaks of them as if they were not motionless, as if, on the contrary, they existed in a motion that is always selfsame. Even this is but hinted at—and I do not want to go deeply into this at present. Time in the firmament is represented as follows: There are two great circles, the circle of the equal and the circle of the unequal. We call these the equator and the ecliptic. On one of these circles the day is measured, the whole firmament revolving once in twenty-four hours around the earth, which was conceived to be at rest. The planets move in the other circle, in the ecliptic, and they differentiate the various days one from the other by means of their ever-changing positions. I have expressed this as follows: In order to measure time we need a clock and a calendar—something that rotates unceasingly, and something that is always different, so that we can recognize which one of its revolutions we are observing. In Plato's system, this is represented by the day, by the circling of the planets. But at this point Plato tacks on a Babylonian theory (as I have learned from van der Waerden), namely, the theory of the Great Year or, as it is also called, the Platonic year. It is that span of time at the end of which all the planets are once more situated where they were before. Plato hints at the notion (which in other places was expressed explicitly) that when all the planets are once again where they were before, the world, in principle, will be once more as it was at that time. Thus the concept of time, even according to astronomical theory, is cyclic. I should think that, according to philosophical judgment as well, Plato's time must be viewed as cyclical, for how can it be the likeness of what abides in the One if it is itself generated from the One, never to return whence it came? If time is really to be the likeness of eternity, a forward thrust of time, numerically measurable, must be conceived as turning back upon itself. I should like to formulate this as follows: If one thinks Platonically, the magnificence of the world consists in the fact that nothing new happens in it. If something new were to happen in the world, there would have to have been a time when the world was not as good as it could be. But according to the *Timaeus*, it is not even permissible for us to conceive that the world could be inferior to what it can be, nor that the Demiurge, in making it, looked to any model other than the best one. The theory of the magnificence of the world, as a result, requires that nothing new shall happen in it, and this means that time is cyclical.

If we turn to our own period, we of course find many departures from this Platonic plan, yet it has left an effect on us that enters into every aspect of our era. The question is: How much of all the foregoing is realized in contemporary science?

IV

Let us look again at the 17th century, at Kepler and Galileo. For them, this Platonic plan is not a clear-cut philosophical theory but rather the great reservoir of images through which he who is engaged in natural sci-

ence can give expression to his beliefs. The true strength of this argument was suspected but not really appreciated in the natural science of the 17th century. Since its rigor was not fully grasped, and since, on the other hand, experiences of which Plato had no inkling appeared in ever more rapid succession—experiences which were not easily interpreted through Plato's special constructs—natural science slipped from its Platonic foundations. We find, for example, that the physical and astronomical discoveries of Kepler, which he undertook with personal devoutness and artistic fantasy (traits which were not transmissable), later became tied to totally different philosophies, such as the mechanistic view of the world The mechanist view explains the regularities of Nature in a way that makes the objects of Nature consist, in the final analysis, of matter that has no defining attribute other than impermeability; its laws could be explained in terms of pressure and impact, i.e. in terms of the effect one such impenetrable body has on another. If this theory has not dominated, it has at least strongly influenced several centuries of modern science. It disappeared completely in the atomic physics of our century, since for us the so-called atoms are in fact not little billiard balls; they are, on the contrary, not impenetrable matter at all. We describe them in terms of the mathematical laws of Quantum Theory, and not in terms of picturable images. It is also very easy to demonstrate to what inconsistencies the mechanistic view of the world leads when rigorously pursued, but I shall refrain from this here.

There are, then, empirical theories which teach nothing but that we must submit to experience and be able to anticipate it with our mathematical hypotheses, which then we test against experience. These theories, to be sure, do correctly describe what happens in physics, but they leave completely unexplained the reason why mathematical hypotheses are successful in the first place.

V

If we re-enter the physics of the 20th century (a science that, apart from a few great figures like Heisenberg is concerned with just about anything but this correspondence with Plato), we find that one feature of Platonic thinking, namely the unity of Nature, is being restored. After the 17th century, this idea of unity was actually conceived only in terms of a mechanistic world-picture. Atomic physics is absorbing chemistry and biology into its various branches—in the theory of evolution, the theory of selection, cybernetics. We do not know how far this development toward unity can proceed. It seems today that a unified natural science, extending as far as the domain of life, may be possible. For its part, physics is growing away from the classical disciplines and merging into one single theory, Quantum Theory. Though today still incomplete, elementary particle physics may yet explain why there are precisely these elementary particles and no others, by reducing all of this to a single basic law. It is for this hoped-for completion that Heisenberg, in particular, has created his schemas. Einstein had his eyes upon this fundamental possibility in his unified Field Theory. Using quantum theoretical means, Heisenberg and other elementary particle physicists are today seeking new and better ways to exhibit this unity. It seems, then, that the result of the historical development of physics will finally prove to be that it has a unity as its fundamental principle. The question is whether this unity may not be centrally related to that very unity which Plato in his time intended to search for.

If one especially wants to take up Heisenberg's idea of symmetry again, one can say that Plato sought by means of a hypothetical and, we must admit, a technically incorrect method to explain the symmetry groups that Heisenberg simply postulates. Plato explains the regular solids in terms of the fact that they all have the same three-sided figures as boundaries; he explains the fact that these triangles are all the same by the fact that they all have equal sides. He accounts for the fact that these sides are also equal by invoking, in the final analysis, the principle of parity which stands at the origin of the entire construction. With this, the theory of the indivisibly smallest lines (poorly established in the literature) again enters in. This theory is at the same time an attempt to subject even the mathematics of the continuum to a yet more ultimate unity. This, in turn, loses itself in what, philologically, we can scarcely grasp. All I am saying is that Plato attempted to explain the symmetry of these bodies. Here again he implicitly goes beyond what Heisenberg ventures. But Heisenberg would of course not resist an explanation of this symmetry—provided that someone were able to produce one.

* * *

It therefore seems that in our physics we are, as it were, recapitulating the various concepts formulated by Plato, but with an essential distinction. The decisive difference lies, as I see it, in our concept of time. Time, as we understand it, is not cyclical; it has an open future and a factual past which never repeats itself. It is the temporality of history. In our physics, time is thus conceived together with space, somewhat in the manner of the Theory of Relativity, which has no genuine parallel in ancient philosophy. Therefore, one can under no circumstances claim that we have turned back to the Platonic model, and I would be misunderstood if it were to appear that I wanted merely to bring about a revindication of Plato.

Instead, I want to say that modern science in its inception referred to Plato without completely fulfilling his philosophical thought. In those very aspects in which it

did not carry Plato's concepts through fully, it was led back to the same problems that Plato had accurately recognized. I am saying, moreover, that a consummation of physics, which today may possibly be on the horizon, requires a kind of philosophical reflection that would stand face to face with Platonic thought. Not without the mediation of Kant, to be sure. For the formulation that seems indispensable to me, if we are to clarify the extent to which we can believe in the mathematical laws of Nature, must contain the proposition that *these laws are preconditions for the possibility of experience*. Otherwise we cannot really grasp the relationship between the empirical verification of this science and the impossibility of grounding it empirically. This Kantian idea, that the laws of Nature are the precondition of the possibility of all experience, would have to be introduced somewhere even if we tried to start the discussion on the ancient Platonic basis. But this would take me beyond the scope of the present discussion.

Notes

[1] A student at a *Gymnasium*, which corresponds roughly to American high school together with the first two years of college.

[2] *Abitur* is the final and comprehensive examination signalling the completion of Gymnasium studies and certifying that the student is prepared to enter the University. It is normally taken by students at age eighteen.

[3] A play on words which has been deleted, since it works only in the original German: "Doch die empirischen Graugänse, die es gibt, wie man so sagt,—wer gibt da eigentlich, 'es' gibt—die empirischen Graugänse sind nur möglich. . . ." (*Translator's note*)

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JEAN E. CHARON

Dissymmetry and the End of Time

Translated by E. B. Sellon

RECENT DISCOVERIES IN PHYSICS ABOUT LEFT AND RIGHT HAVE IMPORTANT BEARING UPON OUR UNDERSTANDING OF LIFE

MORE AND MORE FREQUENTLY, TODAY, people are asking themselves if it is possible to identify exactly what the "phenomenon of Pierre Teilhard de Chardin" really is. His thought, as revealed in his published works, has now reached into every corner of the world. There is no European country today which is without its "Teilhard Societies," where increasing numbers of those interested in the thought of the Jesuit Father meet together. The excellent reception which the ideas of Teilhard has won in the U.S.S.R. is well known. I myself have recently returned from a visit to the United States, where I had occasion to note the extraordinary growth of interest in Teilhard during the past few years. And just the other day I was informed of Teilhard groups which have been organized in several South American countries, as well as in Africa and Asia.

To attribute this success simply to the fact that Teilhard has sought to bring science and religion together seems to me insufficient. There must be another, more profound reason—a reason less "intellectual," more immediate, which concerns us all more directly. For, after all, Teilhard is far from being the first man who has tried to show that science can support religious concepts.

For my part, I believe that Teilhard knew how to find the words which can give *meaning* to our lives, and in general a very precise meaning to the whole evolution of our universe. This is something which bears upon each one of us directly; it is not merely a problem for science, nor is it merely a religious issue. It is rather a profound awareness which is demanded of all men if we are to lead our lives together in a balanced way. If the words of Teilhard sound forth with so much resonance for the men of this second half of the twentieth century, it is because his thought has helped to dissipate a little of the existential anguish of a world which seems to believe itself to be daily trembling upon the brink of chaos.

Teilhard has pointed out to us a fact of great significance: The universe *cannot* move toward chaos, for its *final* state is even now an integral part of the whole evolutionary process. Teilhard has been able to show that this concept, far from being "mystical," springs from a simple observation of the facts, provided that one knows what to look for and is willing to accept its testimony; and, above all, provided that one is willing to examine the observed facts in the context of evolution as a whole, viewing these same facts as

they relate to the *entire* evolutionary scheme, and not in isolation.

I should like to cite a passage which seems to me to reveal most beautifully the depth of spirit which characterizes the Teilhardian "phenomenon":

> By a continuous accumulation of properties (whatever the exact hereditary mechanism involved) life acts like a snowball. It becomes more and more complex. But, taken as a whole, what is the meaning of this movement of expansion? Is it like the confined and functional explosion of the internal combustion engine? Or is it a disorderly release of energy in all directions like the blast of a high explosive?
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> That there is *an* evolution of one sort or another is now, as I have said, common ground among scientists. Whether or not that evolution is *directed* is another question. Asked whether life is *going anywhere* at the end of its transformations, nine biologists out of ten will today say no, even passionately. They will say: 'It is abundantly clear to every eye that organic matter is in a state of continual metamorphosis that brings it with time towards more and more improbable forms. But what scale can we find to assess the absolute or even relative value of these fragile constructions? By what right, for instance, can we say that a mammal, even in the case of man, is more advanced, more perfect, than a bee or a rose? To some extent we can arrange beings in increasingly wide circles according to the distance in time which separates them from the initial cell. But, once a certain degree of differentiation has been reached, we can no longer find any scientific grounds for preferring one of these laborious products of nature to another. They are different solutions—but each equivalent to the next. One spoke of the wheel is as good as any other; no one of the lines appears to lead anywhere in particular.'
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> Science in its development—and even, as I shall show, mankind in its march—is marking time at this moment, because men's minds are reluctant to recognize that evolution has a precise *orientation* and a privileged axis. Weakened by this fundamental doubt, forces of research are scattered, and there is no determination to build the earth.
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> Leaving aside all anthropocentrism and anthropomorphism, I believe I can see a direction and a line of progress for life, a line and a direction which are in fact so well marked that I am convinced their reality will be universally admitted by the science of tomorrow.*

* *The Phenomenon of Man*, Harper & Bros., N. Y., 1959, pp. 141, 142.

This text was published in 1955, after Teilhard's death. Scarcely a year later, science was to establish a *formal proof* of Teilhard's prophetic insight: Evolution progresses toward a well-defined goal, a goal which matter is already tracing for us. But this proof has resulted from work done in the physical sciences, and the physicists (at least for the most part) are not particularly concerned with the effects which their work may have upon the subject matter of the life sciences. The evolution of life is, for them, almost in the realm of the "metaphysical." As for the biologists, who are interested in everything which bears upon evolution, it naturally takes them a certain amount of time to grasp the import of results obtained by their colleagues in the physical sciences, simply because physics speaks a language different from their own.

But let us come to the facts themselves. The discovery which has had the greatest repercussions upon evolutionary theory is known to physics by a somewhat barbarous term: "violation of the principle of conservation of parity." Or, to put it in other terms that are scarcely clearer, this means that matter has the ability to distinguish right from left. We owe this conclusion to two Americans (of Chinese origin), T. D. Lee and C. N. Yang, recipients of the Nobel Prize for Physics for the year 1957.

We should like to examine these conclusions in an "interdisciplinary" spirit, in order to show that their significance for evolutionary theory and for the whole science of biology is fully as great as their importance for physics.

Right and Left

First of all, we shall try to express in very simple terms the way the problem of a possible choice between right and left is posed for matter.

The experiment which was to prove decisive in this domain was performed with those miniscule building blocks which compose all the matter in the nuclei of atoms (and more precisely, in the nuclei of the element cobalt). But, in order to make this more understandable, let us first of all consider an object with which we are much more familiar—the sun.

Let us try to imagine the sun at the moment when it was formed. Space was then filled with countless hydrogen atoms which, impelled by gravitational forces, tended to collect themselves into a denser mass, which eventually became our sun.

Let us now put this question: What *shape* should we expect the sun to take during this period of the condensation of matter?

The answer which at once springs to mind is that the sun will have the shape of a sphere. Why? Because the operation which we are considering has what we call a spherical symmetry. One does not see why matter should accumulate in greater quantity in one particular part

of space than in another; we can hardly imagine the sun with a non-spherical bizarre shape, like that of a cylinder, or even a pear.

Let us look, then, at our real sun, and see if it does indeed have a spherical shape, as we have anticipated. It is almost that, yet not entirely. The sun is a sphere in rotation around one of its diameters; the effects of centrifugal force produce a slight flattening at both poles, and thus the sun has the shape of a somewhat flattened sphere. We understand this readily; it is something which may have been caused by the fact that the original gas out of which the sun was formed was itself in rotation.

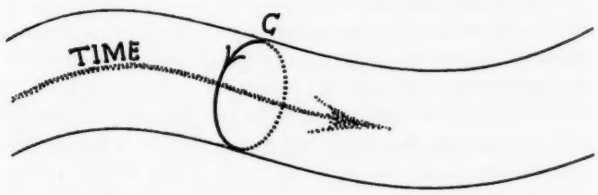
Such, then, is the shape which we can expect when we consider a fluid mass of matter plunged into a space where no direction is privileged (an isotropic space, as the physicists call it).

We note that, in the case of such a flattened sphere (or an ellipsoid) turning around one of its axes, we can never define a top or a bottom, for the two are always just alike. There exists what is called symmetry with respect to an equatorial plane. The same thing holds true with regard to a right and a left; they cannot be defined. If we station ourselves above one of the poles, for example, we shall see the sphere turning from right to left, but if we place ourselves over the other pole, we shall then see the sphere turning from left to right. The same thing would happen to ourselves, if we were to have neither a "top" nor a "bottom." Suppose, for example, that we were to be symmetrical with respect to a horizontal plane which bisected us through the middle of the body so that we had two heads, four arms, and so on. One of these two heads would then indicate one direction of space as being his right, while the other would see it as being his left. In short, it would be impossible in such a case for us to distinguish right from left.

Let us return to our sun. Since the top is here identical with the bottom, we should not expect that the sun, in the course of the reactions of which it is the center, should give special privilege to one direction over another. For example, it would be completely astonishing to us if the sun were to send out more of its rays of light towards the top than towards the bottom. For, if it were to do so, this would prove that its top does not behave exactly like its bottom, and therefore that the top is distinguishable from the bottom, and also the right from the left.

Let us suppose for a moment, however, that the astronomers were to come to this very strange observation: one of the hemispheres of the whole orb shines with a greater light than the other. In other words, more light is emitted on one side of the axis of rotation than on the other. What conclusion must our unhappy astronomers come to in the face of such an observation? They are going to question the physicists, and recollect that our universe is not only made of space, but *also of time*. And as the configuration of the sun, in the shape of a flattened sphere, effectively proves that *no direction of space* is privileged (this configuration indicates an isotropic space), it becomes *necessary* to impute the dissymmetry in the behavior of the sun to time. In other words, it is the *dissymmetry of time* which permits the sun to distinguish right from left, which is suggested to us by its sending more light in one direction of its axis of rotation than in the other. One could also express this by saying that the axis of rotation is here oriented in an *absolute* manner.

But what exactly does a dissymmetry of time mean, and how can this influence the orientation of an axis of rotation, which is a spatial dimension? In order to see how this might be, we can avail ourselves of a model frequently used by physicists when they wish to compare space and time: We represent the sun at a given moment minus one dimension, that is, as a circle C. In the course of time, this circle displaces itself perpendicularly to its plane, sketching thereby a tube with circular section. (see figure)



To say that time is dissymmetrical for the sun is to reaffirm the statement that, at a given moment, the sun is capable of distinguishing its past from its future, for these are *different*. This also implies that the sun *evolves*. One can construe the course of this evolution following the above scheme, by means of an "arrow of time" whose orientation is absolute, since it joins a past state to a future state which is different. But this has the consequence of giving to the circle, which represents the sun at any given moment, *two* faces which are distinguishable from each other—one which is turned toward its past and one which faces its future (different from its past). Thanks to the arrow of time, we can now orient the rotation of the sun around its axis in an *absolute* way. It is conceivable, in this case, that the basic matter which is the sun will have the ability to make this distinction between its past and its future by means of a distinction between its properties according to the direction of space: its upper hemisphere, for example, will be in contact with its future, while its lower hemisphere will be in contact with its past. Thus it does not seem impossible that this could change the conditions of the emission of light from each of the two hemispheres, since past and future are different. The sun would have, in such an eventuality, a top and a bottom, which is also to say, a right and a left.

Cobalt Chooses the Left

This is *exactly* the same kind of experiment which was completed in the United States in December 1956 by the physicist Wu (again a Chinese) and her collaborators, when they sought to verify the theoretical ideas given out during the summer of the same year by the two young physicists, Lee and Yang—with the exception that the nucleus of the cobalt atom replaced the sun. Up to that time the physicists had thought that, taking the isotropism of space into account, any nuclear particle, including the cobalt nucleus, must display properties possessing at least an axial symmetry and a symmetry with respect to an equatorial plane, as the sun does in turning around one of its diameters. This general principle, which was thought to be valid for all phenomena in the atomic scale, was called the principle of conservation of parity. In effect, this was equivalent to saying that atomic phenomena were incapable of distinguishing right from left.

Madame Wu sought to discover if this principle was verified by the nucleus of radioactive cobalt. She operated, of course, not with one, but with a great number of nuclei of this element. She took advantage of the axial symmetry of each nucleus in order to orient all their axes parallel to one another in space by means of a magnetic field. It only remained to verify that there was then still symmetry with respect to an equatorial plane, that is, a plane perpendicular to all the oriented axes of the cobalt nuclei (in practice, a plane perpendicular to the direction of the magnetic field, which orients the axes).

Radioactive nuclei of cobalt disintegrate continuously while emitting electrons. If the phenomenon showed true symmetry with respect to a plane perpendicular to the axes, there would have to be as many electrons emitted above the plane as below it (as many in the direction of the magnetic field as in the opposite direction). Madame Wu presently demonstrated that the quasi-totality of the electrons were emitted into *only one side* of the plane; this observation gave the same dissymetrical characteristics to the nuclear properties of cobalt as did those which we just attributed to our imaginary sun, making it emit more light "above" than "below." In short, Madame Wu announced to an astonished scientific world that cobalt had, not a top and a bottom (for this is not the conventional language of physics), but a right and a left. What is more, when it came to its radioactivity, cobalt had deliberately chosen the left, emitting practically no electrons at all towards the right.

As this choice does not result from the anisotropy of space, we are forced once more to conclude that there is an anisotropy *of time* which allows cobalt to distinguish right from left. *Cobalt is "aware" of a future different from its past,* and it uses this fact in making a spatial distinction between its right and its left. It is capable of making a *choice* between these two directions.

An Irrefutable Proof of Linear Evolution

Let us try to understand the significance of this important proof that cobalt is "aware" of a dissymmetry between its future and its past; let us make an effort to draw forth the consequences which are implied for the evolution of our universe *as a whole.*

First of all, since cobalt is "aware" of a future different from its past, it follows that this future *is on the way to be manifest,* else there would be no sense in saying that it is different from what went before. But, in physics, a phenomenon can never be dissociated from all the other phenomena which surround it. Thus it is not only the future of cobalt, the subject of the experiment, which will be realized; the future of the whole universe is bound up with that of cobalt. In preferring left to right, the cobalt is proving that there exists a future for the whole universe which is different from the past of the whole universe. Moreover, this implies that the universe transforms itself, or evolves. In this simple experiment of the dissymmetry of cobalt, we have laid hold of an irrefutable proof that there is an evolutionary ladder, so to speak, on a universal scale.

Another important conclusion results. Two general questions confront us when we accept the principle of evolution in the universe: Is evolution cyclical, that is, does it embody a kind of continual return upon itself in time, or is it on the contrary linear, starting from an initial state (the beginning of the universe) and evolving toward a final state (the end of the universe)? Cobalt gives the answer to this problem: If evolution were cyclical, it could be schematized in the shape of a circle; the arrow of time which we described above would turn upon itself and, after a sufficient period of time had elapsed, it would come back to its point of departure. If this were so, the cobalt would regain the *same state* it has at present, whether projected into the future or turned back sufficiently far into the past. There would then be no dissymmetry between its past and its future, for the nucleus of cobalt would always meet itself "in the end." But we have seen that *there is* a dissymmetry of time; the right-left distinction of which cobalt affords proof affirms it. Therefore evolution is not cyclical, but linear. Having taken its point of departure from a certain initial state, the evolutionary process carries everything forward, matter and life alike, toward a final state which is *different* from that in which the universe originated.

The view of the universe which comes to us as a result of this recent scientific discovery about cobalt is therefore singularly more precise than that which we had before. The universe is not an aggregate which evolves merely according to the laws of chance. Rather, it is progressing toward "something" which is quite definite. To be sure, we do not know exactly what this "something" may be. However, we do know that this final state of the universe

exists, and that it is *different* from its initial state.

Is it possible for us to gain some notion of this final state toward which the universe is tending? In order to offer an answer to this question, we can consider what we know of the evolutionary history of the universe as a whole, and try to extrapolate this evolution into the future. We shall put this question to cosmology, and shall also query biology with respect to what is now known about the evolution of life.

The Evolution of the Physical Universe

All cosmologies seem to be more or less in accord on one point: The universe has had a beginning in the far-distant past, at least ten billion years ago. The physical state at that initial moment would have been one of extremely high temperature, probably at least a thousand billion degrees. In order to understand what such a figure means, it is enough to say that a ball of fire the size of one's fist would have, at that temperature, enough heat to bring to the boil (starting from a temperature of 20°C) a volume of water equal to that of our earth! At such a temperature no matter could exist; all was radiation, which is to say, light. On this particular point, indeed, science corroborates what the Scriptures tell us: In the beginning, light was created.

Such a universe of light was totally undifferentiated, for it had no structure. Space was uniquely filled with a vast assemblage of photons of light, moving randomly in every direction. Photons are particles which are completely isolated from one another, for they are not surrounded with any force fields, such as the gravitational, which are associated with matter and which bind the particles together.

If, then, we were to sum up briefly what we know about the initial state of the universe, we should say that it was *undifferentiated,* and made up of *independent entities.*

Subsequently the sub-atomic particles were formed, and then the atoms which, as we know, have a definite structure, with a heavy central nucleus around which the lighter electrons revolve peripherally, just as planets circle the sun. We witness here the first differentiation, in the creation of organized structures. And we witness also a tendency toward cohesion, since the particles of matter interact among themselves from one end of the universe to the other, through the medium of the fields of force which are localized around them.

Next, the immense cloud of material particles was sundered into a number of smaller clouds, primitive forms of what was to become the billions of galaxies which are scattered across the arch of heaven. In each of these galaxies matter condensed in myriads of points, under the effect of gravitational forces, which pulled the particles toward each other. These condensations, which heated as they contracted, were to become the stars in our sky. The gaseous nebulae surrounding each star were themselves condensed to form the planets, as our own solar system illustrates. Here again we witness, this time on a cosmic scale, the formation of precisely ordered structures, that is, a tendency toward differentiation. On the other hand, since the stars send their light toward every point of the firmament, there is also an ever-increasing degree of unification (that is, binding) among the different regions of the universe.

So we see, in the case of the infinitely small as in the case of the infinitely great, evolution reveals a *tendency toward unification and toward differentiation.*

The universe was soon to accelerate its rhythm in this same evolutionary direction, in orienting itself toward living structures.

The Evolution of the Living Orders

Life is, in effect, a new stage in differentiation; individual living structures develop an increasing independence of their external environment. It is also a new step toward unification, since successive generations bind themselves together in time by means of reproduction, and in space by means of nutrition (cycles of carbon, of nitrogen, etc.). With man there comes yet another differentiation and also a new level of unification between the individual structure formed by the cosmos as a whole, with that special human characteristic which we call knowledge.

It therefore appears that on whatever scale we consider the universe, evolution always tends toward greater differentiation (the One continuously "personalizing" itself) and toward increasing unification (the One being increasingly bound to the whole cosmos).

With this "unification through differentiation" toward which evolution appears to be moving, we return to an idea which was cherished by that great evolutionist, Teilhard de Chardin.

We are now on the brink of a juncture between present knowledge of elementary living structures and recent discoveries in physics about right-left dissymmetry.

As we have just seen, the fact that matter is able to choose between right and left is due to the fact that this same matter is especially sensitive to the dissymmetry of time or, in other words, to evolution. On the other hand, is it not legitimate to wonder whether any structure whatsoever, in order to gear itself precisely to the evolutionary current of the universe, might not of necessity have to express a similar distinction between right and left?

Ever since Pasteur so rightly insisted upon this characteristic, everyone knows that living creatures are precisely constructed of molecules which exhibit, in quasi-totality, this same right-left molecular dissymmetry. The long chains of life are, in reality, built up of what are called asymmetrical carbons. These are molecules carrying a central atom of carbon surrounded by four different atoms or groups of atoms (radicals). These structures are called

asymmetric because they cannot be superimposed on their own image in a mirror; there are always *two* possible molecular arrangements, which cannot be superimposed upon each other. One molecule is said to be right, the other, left.

Such an asymmetric carbon holds within its four "arms" an exceedingly curious kind of space, one which is capable of acting on a certain kind of light (called polarized) in such a way as to turn the plane of polarization of this light either to the right (carbon which is asymmetric right) or to the left (carbon which is asymmetric left). Now this minute region of space which the asymmetric carbon encloses is also isotropic, as was the physical space just described, surrounding the radioactive cobalt. In fact, the rotation of the plane of polarization of light in no way depends upon the orientation in space of the asymmetric carbon. We therefore conclude that this minute amount of space enclosed within the four asymmetric carbon arms owes its ability to choose between right and left only to the fact that it is dissymmetric in *time*, not in space. In short, the space which the asymmetric carbon encloses is entirely similar, although on a much reduced scale, to the space of the universe as a whole, and this space *is evolving toward a well-defined future state.*

The physicists do not much like to admit, in formulating their description of nature, such a "wave of the future" in the direction of the present, for this would amount to saying that a future state can in some way intervene to guide phenomena situated in the present. They prefer to speak in terms of force fields which fill space and give rise to the evolution from a present state toward a future state which can be forecast if the initial conditions and the laws governing the field are known with sufficient precision. In order for us to conform to this tradition, and express ourselves in more orthodox language, we shall therefore say that there exists a certain kind of "evolutionary field" which fills the space enclosed by asymmetric carbon. Of course the space associated with *one* single asymmetric carbon molecule is too limited to be envisaged as the scene of evolution of *other* material particles. But we can conceive that life, which joins together in its long chains millions of asymmetric carbon molecules, is able to create in this way a particular region of space which is much vaster, and which encloses this evolutionary field of which we speak. In such a space the molecules of matter will obey the laws governing the evolutionary field characteristic of life.

I do not hesitate to affirm my conviction that asymmetric carbon constitutes the first step of matter toward living organisms—the "missing link" between the inanimate and the animate.

An Evolutionary Field

There is no doubt that up to now it has been very difficult to define the laws governing the evolutionary field. We must confine ourselves, for the moment, to recognizing its undoubted existence. Theoretical studies and elaborate experiments will naturally be indispensable in order to go farther.

But, as of now, it appears possible to make two kinds of statements, as follows:

1. It is far from certain that we must think of the evolutionary field as different in nature from other physical fields already known to us. These, let us remember, number four, distinguishable by their interactions which are described as strong, weak, electromagnetic, and gravitational. It would appear, moreover, that in the space of the living orders there is present a coordination and a particularly close linkage of these four fields. This evolutionary field would represent a kind of "unitary form" of all the fields now known, operating all together in order to achieve a well-defined future state. (This future state will constitute part of the "boundary conditions" of the evolutionary field, to put it in scientific terms.) After all, the physical fields known to us already reveal that the universe has evolved out of its chaotic beginnings into a present state which is infinitely more unified and more differentiated, as we have indicated above. Why, then, should we not think that the same kinds of known fields would also be capable of fostering the evolution of these minute particularized regions of space constructed around the asymmetric carbons—which are "living" space? Only the scale of space and time would be much reduced, a fact which would explain why we witness, in living processes, an elaboration of "ordered" forms at a rhythm which is much more rapid, and in volumes which are much smaller, than at the scale of the whole universe. Fundamentally, the process would be the same; the living would be a small evolving space in a far greater evolving space. Without doubt the same fields are at work in both cases, orienting the One, as they do the All, toward the final state of the universe.

2. We can scarcely doubt that the evolutionary field which governs the living, like everything else in the hierarchy of the whole universe, is tending toward greater differentiation and greater unification. One of the aspects which is perhaps most striking, when one considers the workings of life as, for example, in the cell, is contained in this two-fold statement: Each element in the cell appears to act with great *independence* (consequently individual structure is highly differentiated); thus, during the period of cell division, one can break up the chromosomes without injuring the spindle, disorganize the spindle without impeding the cleavage of the chromosomes or the cytoplasmic division, and so on. But, nevertheless, in spite of this independence, each element *coordinates* its activities perfectly with those of others (hence the structure of the whole is closely unified), in such a way

that the over-all effect is harmonious and permits convergence toward an ordered state. This progress toward "unification in differentiation," which characterizes all evolution—as Teilhard de Chardin has so ably shown—will thus be one of the fundamental features of an evolutionary field of life.

From Man to Mankind

To act freely, but to choose only those acts which permit the whole to make its way harmoniously toward the goal which evolution has decreed! To know what that goal is, to perceive spontaneously the act which must be carried out in order to cooperate with the acts of others! To desire freely and individually what all long for, what indeed the whole of evolution demands! Herein lies the beautiful example of organization which life presents to us, beginning with the molecular level. We might well wish that the same thing could be said of our human organizations!

The prime mover in this "free coordination" within the cell is undoubtedly the fact that each living element has an awareness of the final state to be attained. This state is neither "debated" nor "debatable"; it is defined by boundary conditions which govern the behavior of elementary living forms, and thus guide life toward the goal which evolution has assigned it. Certainly, such words are too anthropomorphic to interpret properly the behavior of life in the elementary stage. Nevertheless one can hardly doubt that there exists, in the case of each cellular element as in the case of each complete cell of our body, this independent and spontaneous effort to progress toward a known goal which promotes the order of the whole. One need only observe how life multiplies itself in the living cell to be convinced of this.

If we consider mankind as a whole from this same point of view, does there not come a profound awareness that knowledge *in the present* of what the humanity *of the future* will be would equally help each one of us to act freely and to coordinate our actions with those of others, following the example of processes which we witness throughout the whole evolution of life?

Such a humanity, perfectly unified yet preserving individual freedom, will constitute a new being for individual men, as man does for each of the cells of his body. This unified mankind must be regarded, from now on, not as a fiction nor even as an ideal, but as the *inevitable reality* toward which we are inexorably on the move. As soon as that future state is experienced by each one of us as an existential reality, it will become a true "boundary condition" which (as in the case of all primitive creatures) will spontaneously suggest the act to perform, the word to speak, the thought to have, in such a way that the whole expression of the individual self will be simultaneously free and coordinated with that of others.

It cannot be doubted that Pierre Teilhard de Chardin was a pioneer who boldly pointed out the way toward that state of spirit necessary for man if he is to surmount a new evolutionary threshold, that which leads from Man to Mankind. He has shown us that a better understanding of the living can help us to comprehend not only *how* we are made, but also *why* we are made. And this, when one thinks of it, is perhaps still more important.

Jean E. Charon is a physicist who is deeply concerned with relating the gains of science to the problems of man, or to put it more correctly, with discovering a unitary principle which will relate the diverse aspects of the phenomenal world, and will encompass not only man's knowledge, but also man's knowing.

Dr. Charon, who is Director of the Centre International Cultural d'Aigremont, and President of the Association pour la Cooperation de la Jeuness Mondiale, is also a member of the Centre d'Etude des Consequences Generales des Grandes Techniques Nouvelles. His most recent book, L'Etre et le Verbe, Eds. *Planete, Paris, is an effort to apply mathematics to a solution of the most fundamental problem posed by the human condition.*

HAROLD J. MOROWITZ

Biology as a Cosmological Science

THE UNDERLYING PRINCIPLES BEHIND THE EVOLUTION OF STATES OF INCREASING ORGANIZATION HAVE IMPORTANT BEARING ON THE RELATIONSHIP OF MAN AND NATURE

To set the tone for our inquiry I would like first to quote from the perceptive essay by the English biophysicist, J. D. Bernal.[1] He wrote:

> We may begin by asking the question, does biology exist? I believe there is a radical difference between biology and the so-called exact or inorganic sciences, particularly physics. In the latter, we postulate elementary particles which are necessary to the structure of the universe and the laws controlling their movements and transformations are intrinsically necessary, and in general, hold over the whole universe. Biology on the other hand deals with descriptions and orderings of very special parts of the universe, which we call life. Even more particularly in these days, terrestrial life. It is primarily a descriptive science more like geography, dealing with the structure and working of a number of peculiarly organized entities, at a particular moment in time, on a particular plant. Undoubtedly there should be a real and general biology but we can only just begin to glimpse it. A true biology in the full sense would be the study of the nature and activity of all organized objects wherever they were to be found on this planet and others in the solar system, in other galaxies and at all times future and past.

This statement by Bernal, particularly the last sentence, lays down the credo of a cosmological biology: It is the study of the underlying principles behind the organization of matter, the evolution from less organized to more organized states. Stated in this way, our study takes us back to its intellectual roots in the 19th Century. In 1862, Herbert Spencer[2] published his book *First Principles*, in which he argued that there is a fundamental law of matter which he called the law of persistence of force, from which it follows that nothing homogeneous can remain as such if it is acted on, because any external force must affect some part of the system differently from the way it affects other parts, and hence cause differences and varieties to arise. From this it follows that any force which continues to act on a homogeneous system must bring about increasing variety. Spencer believed that this law was the key to all cosmological development, as well as to all biological development. He was a universalist, who saw in the law of general evolution a transcendent principle

for all philosophy. For him, evolution was an integration of matter and concomitant dissipation of motion, during which the matter passed from an indefinite incoherent homogeneity to a definite coherent homogeneity, and during which the retained motion underwent a parallel transformation. The original edition of Spencer's *First Principles* possessed a kind of buoyant optimism about the future of the universe as evolving toward better and better things. However, even as Spencer's *First Principles* were being formulated, two developments were occurring, one of which would bolster his theory and a second which would serve to drain much of the optimism from the philosopher's latter thoughts.

Charles Robert Darwin's world-view-shattering work on the origin of species was published in 1859. In retrospect, what Darwin did in a general sense was to force the intellectual community to look at man as being *in* nature, as being a part of nature. The biological uniqueness of man was obliterated, and hence his philosophical uniqueness was called into serious question. The *Origin of Species* was truly mankind's loss of innocence. From a scientific point of view, Darwin laid the empirical foundations for the theory of biological evolution, thus strengthening the arguments of general evolutionists, such as Spencer.

The second great scientific legacy of the 19th Century was the development of the laws of thermodynamics. Their discovery was contemporaneous with the development of the evolutionary theory of biology and they have had an equally profound effect on our world-view. Thermodynamic theory had its beginnings in the industrial revolution and was therefore very closely related to the operation of the steam engine. Indeed, Professor Lawrence Henderson used to comment that the steam engine did much more for science than science ever did for the steam engine. Insofar as the second law of thermodynamics has affected our world outlook we might likewise comment on the debt of philosophy to the steam engine.

In any case, beginning with Sadi Carnot's brilliant essay in 1824 there developed a purely physical theory which indicated that the universe as a whole is moving from orderly to more disorderly states. This theory was clearly stated in 1852 in a paper by William Thompson entitled "On the Universal Tendency in Nature to the Dissipation of Mechanical Energy." Thompson gloomily concluded that "Within a finite period of time to come, the earth must begin to be unfit for the habitation of man as at present constituted, unless operations have been or are to be performed which are impossible under the laws to which the known operations going on at present in the world are subject." This type of thermodynamic statement was completed when Rudolf Clausius introduced the concept of entropy in 1865 and enunciated the essentially cosmological view that the energy of the universe is constant and the entropy of the universe tends toward a maximum.

Entropy in this sense can roughly be equated with molecular disorder, so that in Clausius' view the universe was decaying to a maximally disordered state. Thus the biblical "end of days" eventually yielded to

> This is the way the world ends
> This is the way the world ends
> Not in a bang, but a whimper.[3]

When Herbert Spencer became aware of these developments in physics his thoughts took on a decidedly less optimistic hue. The first edition of *First Principles* read: "Evolution can only end in the establishment of the greatest perfection and most complete happiness." Alas, that cheerful sentence is completely missing from the sixth edition of his work.

We have spoken of Darwinian evolution as a loss of innocence. Indeed, it can be argued that the combined impact of evolution and the second law of thermodynamics represents the ultimate in nibbling on the forbidden apple. For not only is man himself a part of nature, a naked ape in the current idiom, but he is a naked ape in a universe that is decaying to a homogenized nothingness. Any philosophy of man or any theology which is not adjusted to this particular loss of innocence is simply ignoring the intellectual scientific milieu in which modern man must function.

It is extremely important to realize the full impact of the preceding ideas, because for Western man, at least, they represent a sharp break in the myth structure that has sustained him for many thousand years. Regardless of the mythological details, there was almost always an underlying assumption that man was something quite apart from the world in which he functioned, something special and unique from nature, and destined to rule forever. If he envisaged the end of the universe, it was in an eschatological sense which was itself centered on man and his eternal being.

These ideas of man and eternity were violently shattered by the scientific thought of the nineteenth century. We are only now beginning to realize what happened and to try to pick up the pieces that resulted from the impact of 19th Century biology and thermodynamics on the philosophical structure of Western thought. It is therefore extremely important to understand in a quite detailed and almost technical sense what is being said by these sciences, and what they do and do not allow us to admit with respect to a metaphysical world-view. This is the philosophical thrust of C. P. Snow's message that the scientific and humanistic culture must learn in a rather detailed way to communicate with each other.[4]

One note of further interest is the claim by some environmentalists that the ecological crisis has arisen due to the failure of man to realize that he exists within nature. There is a cultural lag between the scientific realization and the social implementation.

Returning to a previous theme, we note that the two great scientific developments of the 19th Century, one in biology and the second in physics, were apparently at odds with each other. Biologists noted an increasing development of

complexity and an evolution toward greater fitness. Physicists, on the other hand, spoke of energy running downhill and of cosmic processes taking place leading to universal molecular disordering. This apparent conflict between biology and physics began in the mid-1800's and still rages today among some who have failed to grasp the real nature of the problem. One of these is Julian Huxley, who as late as 1959 wrote that evolution is an anti-entropic process running counter to the second law of thermodynamics. This, however, just is not so. The solution to the dilemma which bothered Huxley in 1959 had in fact been glimpsed by Spencer in 1852 and was rather formally stated in 1866 when the very far-seeing Ludwig Bolzmann wrote,[5]

> The general struggle of the living beings for existence is therefore not a struggle for materials nor for energy (that is present in every body and in large quantity as heat, unfortunately not interchangeable) but a struggle for the entropy that becomes available in the transition of the energy from the hot sun to the cold earth. To exploit this transition as much as possible the plants spread out the immeasurable areas of their leaves and force the solar energy in an as yet unexplored way to carry out chemical syntheses of which we have no idea in our laboratories.

It is interesting to note that this statement by Bolzmann —which is many decades ahead of his time—contains, as we shall see, the essential solution of the apparent conflict between biological and physical evolution.

We must turn now from our historical introduction to a consideration of the present relations between the second law of thermodynamics and biological evolution. An understanding of this point will allow us to project ourselves into cosmological biology.

First, we point out that second law of thermodynamics in its simplest form states that it is impossible to construct a device which, operating in a cycle, will produce no effect other than the transfer of heat from a cooler to a hotter body. This simple notion that heat always flows from a hotter to a colder body can be generalized to predict the universal distribution of energy from its stored forms to heat, or more precisely to molecular motion. Second, we note that since its introduction over a century ago no evidence has come forth to challenge the second law of thermodynamics. There seems no reason to doubt that the universe, or at least that portion of the universe which is accessible to our observation, is running downhill in the sense that energy is being uniformly distributed by being drained from local sources such as the stars and gaseous nebulae and diffused into the radiation field of outer space. This view has two rather profound consequences: first, that the universe has an origin, or as some would rather term it, a creation, and second, that the known universe will retire into an equilibrium oblivion at some time in the very distant future.

Life as we know it, however, is not a property of the universe as a whole, but of planetary surfaces—in particular, the terrestrial surface. These surfaces are not at equilibrium and are not approaching equilibrium, at least not in the next few billion years, because they constantly receive radiant energy from their central star (which is the sun in our case) and re-radiate infra-red energy to outer space. A system which constantly receives radiation from a hot source such as the sun and constantly rejects energy to a cold sink such as outer space is not an isolated system, and need not be tending toward maximum disorder, that is, toward maximum entropy.

The requirement of the second law is that the entropy of the entire system is always increasing. This does not rule out the possibility of local ordering or entropy decreases which are offset by greater entropy increases elsewhere in the system. If we consider the whole system of sun, planet and outer space, the process of transfer of energy from the hot star to the cold of outer space is clearly a dissipation of cosmic energy, or an entropy increase. Therefore there is no contradiction between local ordering on the surface or the earth (evolution) and the laws of thermodynamics.

Evolution of life cannot at the moment be predicted from the laws of thermodynamics. The physical principle merely states that the molecular organization of planetary surfaces which we know as evolution involves no violation of thermodynamics principles. That is to say, thermodynamically speaking, life can happen. Since we know that it has already happened, it is a comforting thought to realize that it is possible.

The reason that 19th Century physical chemists were unable to make any predictions about biological organization was due to the fact that their elegant theoretical structures dealt almost entirely with equilibrium systems. In such systems no processes are taking place, and a particular simplicity and uniformity results. These equilibrium states were used as conceptual devices to make limiting statements about what could and could not happen.

A few remarks on the structure of science might be helpful at this point. Scientific thought narrows down the whole universe of questions which can be asked and concentrates on the particular sub-set of those which are, in principle, amenable to answer. In picking that sub-set of questions in thermodynamics, 19th Century physicists and physical chemists moved toward the abstractions and conceptualizations of equilibrium. An equilibrium state occurs in a system which has been in isolation and has aged for a very, very long time. This construct was a brilliant conceptual device which enabled the formulators to make all sorts of useful statements about what could and could not happen in particular systems. The approach is, however, very limited. It is confining because in day-to-day life we almost never encounter equilibrium systems. To be precise, we *never* encounter equilibrium systems. Everything is in a dynamic state in which energy is being moved from its sources to its sinks; there are great flows of energy, and the

processes that we see around us, preeminent among them biology, geology and meteorology, are characterized by this non-equilibrium character.

It must be realized at this point that physics and physical chemistry have only made the first stumbling steps towards a non-equilibrium theory of thermodynamics. This is a discipline that is in its formative years. Lars Onsager's original papers on the subject were published in 1931. These papers are an introduction, and although there is an increasing effort in this area, there are still more questions than answers. At the moment we lack either a theoretical or an experimental basis to talk very much about non-equilibrium processes in physics. It has not been a popular subject; actually one has the feeling that it has been pursued in recent years mainly in those countries that did not invest enormous resources in their own nuclear accelerators. Much of the work has come out of Belgium and the Netherlands. I am making these points about the sociology of modern physical sciences to stress the vast lacunae which exist in those areas of physics and physical chemistry which would be the most important for our understanding of biology, and our subsequent ability to use biology in a more general cultural sense. There is, however, an implied criticism of the extent to which physicists have pursued the popular and the faddish while ignoring some of the most important underlying areas of natural philosophy. I write this to alert physicists or physical chemists to the enormous potential of this area of inquiry.

Living organisms are preeminent examples of the kind of non-equilibrium system we have been discussing; indeed they are not only non-equilibrium systems but are very far from equilibrium systems. A great part of the problem of general biology is that we do not know in detail how to deal with such systems. Some results which we have available to us today make it clear that both molecular and macroscopic organization inevitably occurs in non-equilibrium systems. That is, the molecular disordering which is characteristic of the second law of thermodynamics is reversed in non-equilibrium situations where there are local tendencies toward molecular ordering. There is a spatial ordering of components and selected tendencies towards certain chemical compositions.

A series of non-equilibrium experiments motivated by an interest in the origin of life has been carried out during the last twenty years. These studies began with the Urey-Miller syntheses in the early 1950's. In these first experiments, a gaseous mixture of methane, ammonia and water was subjected to the continuous flow of energy from an electric spark, and the products of the reaction were trapped in liquid phase water. These reaction products were then chemically analyzed. The exciting result was the production of a wide variety of molecules which everyone had previously believed to be exclusively characteristic of biochemistry. This type of experiment has now been repeated many times, using different starting materials and different energy forms, such as heat, ultraviolet light and ionizing radiation. These experiments have consistently produced chemical species which are characteristic of living systems. Thus this class of non-equilibrium experiments demonstrates a tendency toward that type of molecular order which we see in biology.

From the theoretical side, it has been possible to develop an interesting proof showing that cycles of matter must inevitably occur in a non-equilibrium system such as the one we have been discussing on the earth's surface.[6] Thus the major ecological cycles such as the carbon or nitrogen cycles are not biologically unique, are not something apart, but represent a general property of a certain class of non-equilibrium systems. A planet like the earth will therefore have something resembling ecological cycles whether or not it has a biology, in a conventional sense. Cycles of photosynthetic fixation followed by subsequent oxidation or reduction are not unique to biology, but may be theoretically predicted for a wide class of chemical situations. This means that planetary surfaces in general must be organized in virtue of being an intermediate in the flow of energy from the sun to outer space. As a consequence, whenever we get to examine the surface of another planet we should expect to find some kind of molecular organization on the surface. This is not to assert that the conditions will be right for the conventional forms of terrestrial biology, but that we should certainly expect to find some kinds of photosynthetically mediated molecular ordering. This should be true of any place in the universe, any portion of the system which represents an intermediate between the flow of energy from the stars to the almost absolute zero cold of outer space.

However, from our limited terrestrial scope this appears to be rather a bloodless description of life. It seems a long way from the molecular ordering of pre-biological chemistry to the exquisite set of ordered objects that we know as *Homo sapiens*. This brings us directly to the next question: Given the fact that ecological energetics and molecular ordering in general follow from physical principles, what is the range of systems that will display the exquisitely high degree of atomic arrangement and broad developmental potential that we find in terrestrial living systems? At this stage the essentially thermodynamic reasoning that we have been using appears to be too crude, and alternative approaches must be tried. How can we then explain the origin of self-replicating systems? How can we probe the philosophically most exciting questions that science has to offer? How can we ultimately know about the generality of biological process?

There are three rather divergent approaches that have been offered to this line of questioning. First, there has been a current restatement of the theological principle by Pierre Teilhard de Chardin, who has elevated the theory of evolution to a theo-cosmological status and endowed the whole universe with a spiritually-driven evolutionary direction which surpasses in intensity even the evolutionary thrust of Herbert Spencer.[7] Secondly, there has been a

point of view identified with Walter Elsasser, who maintains that the epistemological foundations of quantum mechanics are insufficient to deal with systems of biological complexity.[8] Hence physics, as we now know it, will always lack completeness in describing biology. Although no contradictions exist between biology and physics, physics is just insufficient to the task. The third point of view is that there are principles of physics which guide the molecular organization of non-equilibrium systems.[9] For proponents of this point of view, the greatest challenge for modern students of biophysics is to develop an understanding of those principles.

If we are able to obtain this kind of theory of self-ordering, it should challenge us to apply the most profound insights we can muster to link biology to non-equilibrium physical chemistry. The job seems very formidable indeed but the rewards could be very great—the ability to seek our origins in terms of the laws of atomic interaction. This is truly a new frontier, and one that challenges the maximum intellectual effort of which we are capable.

The energy flow point of view of biology which we have just been discussing has some interesting philosophical spin-off which merits examination. Prior to the theory of evolution, Western biology was almost totally organism-centered, with an object oriented view of reality. Linnaeus, the founder of modern taxonomy, held a rather Platonic view of species, and his taxonomy consisted of finding organisms and placing them in Platonic categories. Museums, zoos and herbariums housed individuals which constituted Platonic types in the Linnaen view. Given the theological presupposition that types were immutable products of divine creation, this approach fitted into the pre-Darwinian world-view.

With the advent of Darwinian evolution and the subsequent development of genetics, the species itself became a diverse collection of variants. Indeed the capacity for variation or mutation was a necessary part of the description of all species. The species in the new biology has properties that go beyond that of the individual. The gene-pool, or the collection of genes, was the prime factor in the biological description of the species. The type and distribution of allelic genes within the genome is, however, a property of a group of organisms and can in no way be deduced from the study of a single individual or small collection of individuals. The important unit in biology shifted from the individual organism to the more distributed and abstract notion of the species.

The study of ecology goes even further, and indicates to us that the species itself exists only in relation to an ecological niche within a biome, which includes other living organisms as well as geological factors. The description of the species now includes a much broader phenomenological range. The energy-flow point of view of ecology expands this viewpoint because the biological description now begins with the sun's energy (photons of the solar spectrum), works its way through food webs, material cycles (such as the carbon, nitrogen and sulphur cycles) and involves the global biosphere in a way that relates all life on the planet. Biology in the last century has thus moved from an object-centered view toward a continuum view of life.

In *The Meeting of East and West*,[10] F. S. C. Northrop has pointed out that Eastern thought is much more devoted to a directly given continuum view of reality, while Western thought is much more centered on theoretic constructs, such as objects. Western biology began with *Historia Animalium* and, in referring to this work of Aristotle, Northrop notes, "It led him to the thesis that it is the concrete individual embodying in itself both the prime matter and the abstract logical universal which is the real thing." Biology has developed within the Western object-centered atomistic view of reality which has come to fruition in modern molecular biology. More recently, much of biological thought has been moving from the Western orientation to a differentiated continuum view which is much closer to Eastern philosophy. The shift has not been easy to discern because the language of biology and its cultural setting identify the discipline with Western modes of thought.

Emphasis may, however, be shifting somewhat from objects such as atoms, molecules and cells as the final explanation in biology toward viewing the entire planet as the focus of aliveness. Life in this emerging point of view is not so much a property of the individual as it is a property of the entire planetary surface. Individuals per se cannot exist, that is, an individual of one species can only *be* in so far as he is part of the food chain. Plants themselves cannot exist except by the process whereby they are eaten by animals, returning carbon-dioxide to the small molecule reservoir in the atmosphere. Animals cannot exist apart from the food chain. The nitrogen supply that we use comes to us by courtesy of hundreds of other organisms which are chemically processing nitrogen in a wide variety of ways. This notion of life, which began in the purely object-centered view of Western culture, has been moving very steadily toward a continuum view. This represents what is perhaps one of the potentially most profound intellectual mergings of East and West, in the Northrop sense. It is therefore worthwhile to examine the presently emerging biology from this perspective.

Two paradoxical trends exist in contemporary life sciences. One which we have already mentioned is a tendency toward a global continuum view; the second, which emerges from genetics, stresses a kind of radical individuality. Each human is characterized by about one million genes, each of which can exist in any one of several forms called alleles. The number of possible genomes (individual genetic specifications) is a quantity given by one followed by a million zeros. It is one of those enormous numbers that we find difficult to state in a meaningful way. What is clear is that no two humans (with the possible exception of identical twins) have the tiniest probability of being genet-

ically the same. Thus at the genetic level there is a clear-cut distinction between all individuals. This kind of radical individuality is imposed on a continuum point of view which stresses that no individual human exists in any kind of biological isolation: every individual is really very much a part of the global system and his existence itself is related to the existence and the properties of the continuum.

Individuality entered the world, from a scientific point of view, somewhere along the path of pre-biological evolution. It is interesting to think back for a moment to the time when the earth was a kind of bubbling ocean of chemical reactions, and one of the groups of these reactions led to a class of oily types of molecules which formed a membrane or a surface. This membrane folded and sealed off a certain portion of the continuum from the rest of the continuum. This is the beginning of biological individuality in an atomic sense. This development of individuality is somehow at odds with the continuum point of view.

The philosophical distinction between continuum and individuality may relate to the problem we have previously mentioned, how order arises in homogeneous systems. As a prerequisite for the existence of individuality, the ordered continuum must be organized into identifiable entities. When we understand that ordering, we shall be better able to tackle the problem of individuality. It should be pointed out that individuality is not a necessary principle of physical theory. For example, in quantum mechanics electrons do not have individuality, and this profoundly effects the way in which particles can interact.

To further relate the Eastern and Western points of view, we want to state clearly the energy-flow concept of biology. Life exists because energy flows to the earth in the form of solar photons. These photons are incorporated into life processes by means of photosynthesis, and all subsequent life involves the dissipation of that original solar energy. Biological ordering is bought at the price of dissipating solar energy, which is then re-radiated as heat which flows to the limits of outer space. Curiously enough, when so stated, the scientific principle reflects a kind of view that has existed for a long time in Oriental thought. It did not exist as a precise scientific statement but the general ideas can be clearly found in certain aspects of Buddhist thought.

In a book entitled *Science and Buddhism*,[11] P. Dahlke has elaborated the thesis that in theology everything stands, in science everything falls and in Buddhism everything burns. The notion of burning is a metaphysical expression of transience and impermanence. As transmitted in the tradition there is an accompanying mythology that we need not consider here. However, the metaphysics, in its purest form, is a very early statement of the energy flow point of view. Although the Buddhist syntax is entirely different from that of modern science, the notion is clearly present that everything is process—a process which only persists by virtue of some universal kind of energy flowing through the world. From this point of view, the reality of individuals is problematic because they do not exist per se but only as local perturbations in this universal energy flow. As originally presented this must have been a very mystical idea, but a similar kind of idea seems to emerge from modern science. Everything we know of is indeed process, which is mediated on the surface of our planet by the flow of solar energy through all organized structures.

To make this concept more definite, let us try conceptually to shrink ourselves down to atomic dimensions and get a look at the world from the molecular point of view. At this level everything is in an incredible state of random thermal motion. There is just a violent whirling, swirling and moving around in what looks like enormous atomic disorder. This atomic motion is in fact always breaking down existing molecular structures. Indeed, if we take a molecular approach to the second law of thermodynamics, we note that there is an inherent molecular tendency toward decay that is a part of all structures. This is not just a metaphor; for example, in every one of us about seven per cent of the protein molecules in our body breaks down every day and has to be rebuilt by processes within our systems. That stands as a quantitative statement of the Buddhist transience when applied to human beings: seven percent per day is a numerical measure of our impermanance. There is a constant breakdown of molecular structures, and accompanying this breakdown there is a build-up that utilizes the solar energy entering the system through photosynthesis. Life is always a precarious balance between the organized build-up of atomic order and the decay brought about by random thermal motion at the atomic level. Classical physiology recognized this fact in its concepts of anabolism and catabolism, which together constitute the overall metabolic behavior of the organism.

Viewed from the point of view of modern thermodynamics, each living thing, including man, is a dissipative structure, that is, it does not endure in and of itself but only as a result of the continual flow of energy in the system. An example might be instructive. Consider a vortex in a stream of flowing water. The vortex is a structure made of an ever-changing group of water molecules. It does not exist as an entity in the classical Western sense; it exists only because of the flow of water through the stream. If the flow ceases the vortex disappears. In the same sense, the structures out of which biological entities are made are transient, unstable entities with constantly changing molecules, dependent on a constant flow of energy from food in order to maintain form and structure. This description stands as a scientific statement of the Buddhist notion of the unreality of the individual. Among Western thinkers, one might identify this kind of description with Heraclitus.

This viewpoint gives us a "flow" or process conception of ourselves: rather than seeing ourselves as discrete individual entities, we become centers or foci for a build-up of order. The build-up and breakdown of molecular order are linked to the environment around us: the inflows of

energy must come from outside ourselves, and we in turn must radiate energy to our surroundings. Unless there is balance in the surrounding world, the individual processes we have been describing cannot take place. This is a biological, thermodynamic statement of the real necessity for environmental balance. Environmental balance is not something which one must achieve for aesthetic reasons; it is the very key to transient existence in a flow-dominated nature. If we misdirect the flows to re-alter the system, the environment may undergo radical changes, and it may no longer be possible to maintain the kind of stability which we require.

We emerge from the foregoing considerations with some ideas that seem to be important ingredients of the viewpoint we want to take toward man and his relation to the world today.

First, it is clear that man is a part of nature. This is the underlying fact with which we must constantly confront ourselves. If we really took this notion seriously, we would not have ecological crises. The idea that man is part of nature is the ultimate Darwinian statement. The thermodynamic statement is that man is limited. Our surroundings are finite and we are part of cosmological processes. In this sense, I think that we have not understood ourselves and our destiny; the challenge of that understanding still lies before us. The missing principles between physics and biology may be part of that challenge.

We do not yet understand ourselves or the world in which we live. Yet the development of biology, some clues to the universe from physics, and a few hints from the wisdom of the East suggest that the task of understanding may not be hopeless. With just a micromeasure of hope, the task of attempting understanding becomes a joyous endeavor. Cosmological biology tells us that there is more to the universe than we have yet dreamed of.

Notes

[1] J. D. Bernal, "Molecular Structure, Biochemical Function, and Evolution," Chapter 5 of *Theoretical and Mathematical Biology*, edited by T. H. Waterman and H. J. Morowitz (N. Y. Blaisdell Publishing Co.), 1965.

[2] The general viewpoint on Spencer comes from an essay by P. Medawar in his book, *The Art of the Soluble* (London, Methuen), 1967.

[3] From "The Hollow Men," by T. S. Eliot.

[4] See *The Two Cultures and the Scientific Revolution* by C. P. Snow (Cambridge University Press), 1959.

[5] I am indebted to Dr. E. Broda, who pointed out to me this quotation from Boltzmann and provided the English translation given here.

[6] H. J. Morowitz, *Energy Flow in Biology* (N. Y. Academic Press), 1968.

[7] P. Teilhard de Chardin, *The Phenomenon of Man* (N. Y. Harper & Row), 1959.

[8] W. Elsasser, *Atom and Organism* (Princeton University Press), 1966.

[9] Morowitz, op. cit.

[10] F. S. C. Northrop, *The Meeting of East and West* (N. Y. The Macmillan Co.).

[11] P. Dahlke, *Buddhism and Science* (London, Macmillan and Co.), 1913.

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ADOLF PORTMANN

Colors of Life

THE WORLD OF MATHEMATICAL SCIENCE AND THE WORLD OF EXPERIENCE: TWO WAYS INTO REALITY

THROUGHOUT THE CENTURIES extends the search for the nature of things, for the kernel of truth, the wish of the thinker to find the true essence beneath deceitful exterior appearances.

The magic of color is a part of the beauty of the external surface. Color belongs to transiency and to change. The withering of the flower, the dying away of light as night comes—there is little in our experience so symbolic of all transiency as is color.

And because of this transiency, science went into the depths of the things, where it thought to find constancy and certainty: in determining the nature of light, science also determined the nature of color—every pure color that we see is associated with a particular wavelength of light. Once these facts had been established we were able to use numbers and quantities in speaking about certain natural phenomena which, previously, could only be called "red" or "green," or by the name of some other quality within our experience of color. Since the advent of the wave theory, the quantum theory and beyond, we have gained so much significant knowledge by our measuring and computing that many people are convinced that this realm of numbers is the true reality. All this is a victory of research in physics and chemistry—and linked to this victory is the belief that the statements about wavelength and frequency express something more certain than the everyday names of "yellow" and "blue."

But the colors are there! They live so powerfully and so mysteriously in us that we must ever ask ourselves what sort of reality they can possess, outside of our experience. For they, too, are something real—something real in a particular way; and experiments have demonstrated many times that this strange reality exists also for the animals—the hummingbird seeks the flower because of its radiant color, as do bee and butterfly. And the chemist, too, produces a particular color, not on account of its wavelength, but on account of its effect on our eye.

The chemistry of the colors functions at a strange border between two realms: with the precise means of the most successful of the sciences—that science from which many await the true picture of the world—chemistry creates brilliant and beautiful appearances, and these appearances take effect in a second reality, that reality which we experience with our senses. At this border, where two worlds meet in the mind of the scientist, the biologist also works.

While the technical specialists are at work inventing new colors, the biologists have rediscovered the "feast for the eyes" that, quite literally, the world, with all its light and color, spreads before us. They have discovered this "feast" to be a content of all higher life, and today their research offers a way into the hidden relationship between the animals and the world. The study of colors, not as deceptions of the senses, but rather as experience, has come alive anew in the area of biological interest. One of the great steps taken in modern biology occurred when objective investigation of animal experience was recognized as a concern of scientific research—and in this change the miracle of color played an important part.

"Feast for the eyes"—we wish really to take this metaphor seriously in its suggestion of other, more nourishing "feasts." For, indeed, a seeing eye seeks its "nourishment," seeks optical stimuli, and the life of the higher animals includes sources of optical stimulus in multifarious ways in its laws: flowers that promise refreshment, beasts of prey, sexual partners, enemies—all can be optical stimuli.

The world of color with all its magic has become more and more mysterious since the time when scientists realized that many of life's colored creations not only produce colored impressions through some accident, but rather are organized precisely so that they may radiate true visual "broadcasts"—"broadcasts" which are directed to watching eyes as receiving organs, and which, at the same time, function in accordance with the laws of sight and of the production of color. As the eye is made to see, so are many things in the world formed that the eye may see *them*.

We know through experiment that an intense red on the belly of a little fish, the stickleback, is not an incidental by-product of the inner sexual maturity of the male—no, in the play between the sexes this red is comprehended as an exciting signal in the life of the stickleback, the message is "deciphered" and challenges the rival to combat. A model painted red has the same effect—provided it has a vaguely fish-like form, quite distorted forms are accepted as "fish"—but the red must be on the bottom-side as it is in the real stickleback. The fish is very particular about the location of the color but is rather indifferent to the shape of the bearer of red which we present to him in our model.

From such experiments—and there are already many of them—a new attitude about living things is emerging. For these experiments show that the worlds of countless animals are filled as is our own with "qualitative experience," with the kind of impressions well-known to us, not through our intellectual and mathematical understanding, but through our own intuitive experience.

A significant branch of biological research is today investigating such qualitative experience including also the world of color. The goal of this new branch of research is not to discover new things about the wave-nature of light or about the complementary nature of wave and particle, but rather to discover whether or not a fish or a crab lives in a colored world, whether this world radiates in the same colors as the human world and what the magic of color signifies in these modes of life so different from our own.

It is important to see clearly what is unique about this new branch of research. To be sure, analysis via the techniques of the physicist will always retain its significance and its value. And, at the same time, it will remain a constant concern of the biological scientist to find out, for instance, what a great variety of reactions may be evoked by the experience of "red" or "blue," and this type of work will especially concern those scientists whose job it is to produce color in the human, technological world. And yet our analysis of the new branch of work in the biological field is only a part of a much larger task—and not even its most important part.

Workers in the new branch of research seek, in the last analysis, to make their way into the hidden inner world of creatures foreign to them—creatures so remote from ourselves that the utter inaccessibility of their world has again and again been resignedly emphasized. And it is true that I will never experience what the stickleback really sees when I experience "red." But the more profoundly the experiment enters into the life of the animal, the more content our statement achieves. When biologists today demonstrate that bees see ultraviolet, and when, with the help of photography, we are able to prove that many flowers—and also green leaves—radiate ultraviolet light, and that many blossoms even have ultraviolet markings, these discoveries at least point to the fact that the optical world of these insects is different from our own. Where I see lemon-yellow evening primroses the bee sees markings in a shade of ultraviolet which is unknown to us; and our fiery-red poppies shine for the insect not in this burning color, but in an ultraviolet hue that remains a mystery for us. Such a certainty seems to me in itself a significant result.

The things which zoologists know about the color sense of the insects demonstrate that the world of these blossom-visitors provides a colored image of the environment different from our own, and that this special experience of color is an intrinsic part of the insect's world. This discovery reminds us, too, how great an importance we must ascribe to the particular ways of our own colored world. We may surely assume that there is some general similarity in the color vision of vertebrates—but it is very difficult to say, for example, what fine nuances may be made available by the eye of the bird, which contains peculiar color filters in the cells of the retina. And despite many experiments, the color sense of some mammals is still a source of argument—at the high developmental level of mammalian life it is difficult to produce clear proof through experiment. We are left with only a general certainty: the colored

world can appear very differently to different species.

The impressions of color mediated by our eyes are not as valuable in orienting us to reality as are our impressions of shapes and forms. The objective value of being able to see forms, which is provided us by the physical apparatus of the lens, is more significant and more readily demonstrated. And yet the possibility of differences in the experience of color from species to species is attractive in itself: the things of the world possess in our "inside" not only that factual existence which we analyze with the objectifying means of our reason—they have also a special content, and it is this content which gives our feelings their independent life, and provides the gift of image and metaphor.

To the physicist, who, with his prism, spreads the white sunlight into a colored spectrum, this colored band seems to be an accidental piece cut out of a far greater range of frequencies. But involuntarily human experience groups all the colors into an order, in which red and violet are mixed in purple, thus turning the spectral band into a circle of color. And we need not learn this grouping, it is independent of our knowledge about the frequencies found in the wave theory, it is our very own—we feel it. Emotions and sensations, too—not only numbers—give order to the world.

Thus there are two ways in which we can organize our experience of color and we must clearly see the contrast between them if we wish to comprehend and be fully aware of the curious polar tension which is the hallmark of our modern intellectual and spiritual relationship to the world. The world of the computed wavelength and the world of experience—both are valid creations of the mind, both are images of nature, both are ways into reality. One of the most significant aspects of contemporary thought seems to me to be the fact that we no longer see only one of these worlds as the "right" one, but that we rather seek images of the mystery of reality in both of these mirrors. In one mirror our own realm of color appears as a fragment cut out of something larger, in the other mirror it appears as something whole. And, interestingly, we have evidence that the bees, could they paint, would also paint a circle of color—only their circle would consist of other hues than ours. In place of red and green and blue-violet, the bees see yellow, blue and ultraviolet, which is unknown to us—this latter mixes with yellow to form "bee-purple."

Although we can experience the color "bee-purple" as little as we can the color "ultraviolet," nevertheless the experiment brings us the certainty that for the bee, as for ourselves, the colored realm signifies a whole world of experience. By contrasting our own experience of color with that of the bee, we discover that the orientation in the world provided us by our own sense of color is very subjective. As I have said, this may be a disappointment if we are interested only in gaining objective information about the hidden reality of the things through all the means of reason.

But does not the same fact point to a rich gift which has been given us? For we possess a wealth of visual experiential possibilities, and, unconcerned with other species' experience of the world, we may with this our wealth of possibility and through the work of the artists, experience unique creations of the human spirit in the world of color. This is the incomparable experience which is ours when we allow Van Gogh's irises or sunflowers to affect us, a field of poppies by Monet or the wonderful breath of the fruits in Chardin's still-lives. It is a life in our very own world, sheltered within the limited circle of our inherited experience of color, enhanced by the transforming spirit of the artist.

I cannot refrain from introducing here a description which tells of the wonderful encounter with color. It was written by a man who, long before the Impressionists, brought our own visual world to flower within himself. The following description of a winter evening comes from Goethe's pen:

"On a winter journey in the Harz mountains I was coming down one evening from the Brocken; the broad meadows about me, the heath below, were white with snow; the scattered trees and out-croppings of rock, the tree clumps, the boulder-masses were covered thick with hoarfrost, and the sun was just sinking down to the ponds of the Oder.

"During the day, with the pale yellow tone of the snow, the scarcely noticeable shadows had been a light lavender, but now, as a stronger yellow was reflected from the brightly-lit surroundings, they had turned to a deep blue.

"And as the sun finally approached its setting and its rays, much reduced by the heavy mists, drew a coverlet of most beautiful purple over the entire world about me, the color of the shadows turned to a green, which in its clarity was like sea-green, but in its beauty like the green of emeralds. The scene grew ever more alive, I felt myself in a fairyland, for all things were clothed in the two lively and so beautifully corresponding colors, until at last, at sunset, the glory vanished into a grey dusk and little by little lost itself in a night brilliant with moon and stars."

And yet we possess not only this wonderful play of our eyes with red and yellow, with green and blue—not only this is our innate way of relating with the things of the world. Woven into our experience of the colors is an innate connection with our emotional life which makes the things of this world into potent sources of rich experience.

This begins early in life: a newborn child, on the very first day of life, responds differently when shown different colors. In the testing of a group of 74 children, their eyes rested an average of 4.5 seconds on pure yellow, but a full 16 seconds on pure blue—a general preference, probably due to the calming effect of the cool colors.

"Cool colors!" Again we stand face to face with the fact

of experiential content: we experience the pole of yellow-red as warm and stimulating, the pole of blue as cool and subduing. The elements of this polarity lie waiting and ready in us prior to all experience, long, long before we can express them in words. Naturally we may not confuse this elemental influence with the symbolic values established by tradition, which we acquire through education, upbringing and historical ties, and which may for instance cause the color of mourning to be black in one group of men, white in another.

Technology, which also seeks, today, to govern and to guide the emotional life of men, is well aware of this innate connection between color and emotion. The modern attempt to reach the soul exploits this connection. The psychologists develop their testing methods on the basis of such unconscious effects of color, whence they hope for insight into our personality. And advertising, armed with this psychology, seeks to win the battle for customers with the help of the colors in which wares are presented.

The origin and flowering of a colored world within us, this glorious gift, which is given to man and to many other living creatures, is a mystery, an inaccessible process. Research is indeed able to reveal certain parts of it: chemical events in the visual substances of the retina, electrical occurrences in the active eye and in the nervous system. Our advancing knowledge of optical events will certainly clarify the processes which help to cause the unique character of the human experience of color. At the present time several theories are struggling to interpret these phenomena and to gain insight into the rôle played in them by various parts of the brain. And biochemistry, too, is concerned with the influence of various compounds on this experience of color; most recently the list of fantastic substances has been enriched by the discovery of the remarkable compound lysergic acid, which performs its function at incredibly low concentration. But the transformation of these events into subjective experience remains hidden from us.

The way of science leads through analysis—yet while allowing full play to our dissecting reason, we must always remember that analysis dissects a whole which we find already in existence and that the parts and partial effects so discovered can be meaningfully interpreted only within the order of this whole. This is true also for a basic understanding of vision: we must never forget that it is not the eye which sees but the live human being.

But the contributions made by life-processes to the creation of a world of color, the production by living things of structures which emanate color—effects which are particularly directed to a seeing eye—they are as full of riddles as are the inner dynamics of sight itself.

In physiological interpretations the existence of color is usually considered as an accidental occurrence which, on account of its utility, has gradually been enhanced in the course of natural selection. This theory treats blossom-visitors particularly well, especially birds and insects whose activities aid in pollenization. They were thought to be nature's own horticulturists. The basic idea behind this point of view is that the colors are primarily chemical results of metabolic processes, and that their accidental accumulation in visible organs gave natural selection the possibility of utilizing their strikingly colorful appearance and of further evolving it.

Today another aspect of the problem is slowly gaining in significance. For it turns out that in many cases very intricate organs, even combinations of several structures, are developed in order to produce particular colors—organs which cannot be regarded as accidental by-products of metabolism.

We are beginning to have a new conception of the appearance of living things. Such vital organs as eyes or brain, heart or kidneys were always considered as organs assuredly not of accidental origin, subject to strict laws of necessity and logically constructed for a particular function. By contrast, the magic of color on the surface of the creatures, the splendor of butterflies and birds, the glittering surfaces of the wings of many beetles, the beauty of the flowers—all these were considered, oddly, as dependent in large measure on accident, or at least as by-products of more profound necessities. It was thought that the omnipotent metabolism at such and such a place in the plant automatically produced the blue or red pigment called anthocyan, and that only by a devious route did this color happen to play a rôle in the service of pollenization by becoming an attractive stimulus to insects or birds. Or it was thought that the metabolism of animals deposited urine-like substances somewhere in the body—and why not in the skin?—just as rubbish is gathered up somewhere, and that thus, by a detour, some pigments now and then came to play a rôle in the dynamics of animal behavior.

Today, by contrast, it seems ever more clear to the acute observer that the organs which subserve the "appearance" are subject to a necessity as powerful as that governing the inner organs; if we investigate carefully we discover that the cost to the organism of the structures subserving its self-representation is no less than that which prepares the development of the heart or the eye. The further we penetrate into the processes which serve the outer appearance, particularly its color, the clearer it becomes that that which is intended to be *seen* in nature is subserved by no lesser complexity and ingenuity of structure than that which sees. Thus, in living creatures that which is to see and that which is to be seen are objects of similarly intricate hereditary preparation. This insight is beginning to prepare the way for quite comprehensive transformations in our image of nature.

Feathers are a particularly striking example of structures formed in such a way that color may be produced. In

the outermost horny layer of many feathers, cells of a peculiar structure, by their light-scattering characteristics, produce a blue color, and combined with them we find a black ground which makes the blue more luminous and intense. "Opaque medium before a dark ground"—here we find realized in a most intricate manner one of the facts characterized by Goethe as a "primary phenomenon of color." The splendid blue of birds and butterflies is such a "structural blue," and the brilliant green of the parrots results from a combination of yellow pigment with the luminous physical blue. On flowers as on feathers, on the wings of butterflies as on the armor of beetles, intricate visual effects are produced: the polished-look of lacquer or silk, a velvety appearance, the glittering of gold and silver, and above all the changing colors of shimmering surfaces. The production of these effects depends upon astonishing structures whose optical achievement was in some cases first revealed to us by the electron microscope. The black of the flowers also results from combination, which plays a rôle in the markings of blossoms; it often forms the "Saftmale"—the sap spots—which point the way to the pollenizing insect. Plants do not possess a black pigment, whereas in animals the most widely distributed pigment is the dark-colored melanin. The dark colors of the flowers result from "subtraction": the incident light is completely absorbed by two complementary layers of color superimposed one upon the other on the flower petal.

White, too, is not produced by a particular pigment. In flowers as well as in the skin of animals, in feathers as in hairs, white is the result of structures which cause the greatest possible scattering of the incident light so that the eye which sees them receives all wavelengths of the sunlight and thus perceives the total effect "white." No pigment lies behind the impression made upon us by the radiant white of the great bindweed blossom or the dazzling white of the swan.

It becomes ever more certain that the structure-creating energies lavished by the hereditary mechanisms of animal and vegetable development in the formation of color-bearing organs is of no lesser magnitude than that invested in structures which at first sight strike the utilitarian mind as far more vital. The strange character of the organs which bear color and which produce it, and the way these organs resist the contemporary attempts to explain them by fitting them conceptually into the utilitarian scheme—all this becomes clearly evident only when we undertake an extensive study of their distribution.

In correspondence with well-founded methodology, biologists involved in investigation of these organs of appearance search at first for functions serving preservation —in other words for life-functions within a very simple realm of significance. In many cases it is not difficult, in investigating colored organs, to discover such a rôle in the life of the animal. Often experimentation shows that many of these patterns serve as aids in the recognition of other members of the species. Thus, in the case of flying creatures, such patterns must be striking in form, unmistakably marking a particular group. In the case of certain bird groups—that is, groups in which the orientation is strongly optical—the biologist's collection of marking-patterns seems to the impartial observer to be a virtual flag collection! The mutual recognition of sexual partners, the identification of young and old members of a species —these are examples which reveal the animals' appearance in service as a "signal." Experiment also reveals the opposite of this, the rôle of concealing, the type of surface-pattern which causes the shape of the animal to melt into its surroundings. The textbooks are full of examples of such clear functions in which color plays its rôle either as a striking signal or as camouflage. And yet the thoroughgoing and carefully carried out experiment turns our attention to the limitations of this approach and leads beyond it into a new territory to which little attention has thus far been paid. We wish to give one example of such a borderline case.

Butterflies make special flights to seek out their partners in reproduction. In careful experiments with the large golden-brown fritillary butterfly, various models have been tested for their effects. The size of the model—as the experiments showed—is important, and the golden-brown background color must also be present. Movement also plays a rôle. On the other hand, however, the experiments show that the black patterning is of no consequence. It may be lacking in the model, it may be exaggerated; the pattern may be present, but it may also be absent: the decisive thing is the color. The optical "broadcast" directed by the wing-pattern to the eye of the butterfly is far more detailed than pure necessity demands!

From this insight it is but a short step to those patterns in nature which are brightly colored but whose color plays no rôle in life—that is to say, color-broadcasts which are directed to no seeing eyes.

A broad realm opens up before the biologist who begins to investigate the sea anemones and worms, the marine snails and many other creatures which play no rôle in the fields of vision of higher animals and none of which themselves have eyes, with which they might be able to see one another. Nonetheless all of them possess colors and markings, often of an astonishing ornamental beauty.

The origin of image-seeing eyes is still a mystery to us, and in the same way the first emergence of colored markings continues to resist our attempts at explanation. But one things we know definitely: these markings are older, in the evolution of animal life, than are the eyes capable of seeing them. Therefore it has been necessary to reserve a particular category for these wonderful patternings, the category of "unaddressed appearances."

The investigator who has had the privilege of entering into this field where our customary notions of utility van-

ish, sees ever more clearly that the concept of utilitarian adaptation has been overestimated in our assessment of the natural forms, and has been made into our chief concern, whereas in reality it is only one partial phenomenon within a much larger area.

Long years of increasing familiarity with marine life have given me a glimpse into this realm, and what I have seen has not only become significant for my own view of nature, but is also a source of ever-renewed joy in the riches of this hidden world. He who has once found the entrance to this enchantment of form and color has found a world of miracles which will not let him go. My colleagues had experiences similar to my own. Marine snails bear witness to a hidden world, difficult of access, which evolved only in relatively recent times.

Here I may not digress into all the questions which these particular snails put to the morphologist. But it is necessary to know that the development of their form and color is a late product of the evolution of molluscs, that more primitive forms of the group bore shells which were rolled up into a spiral, that in a series of stages the shells grew smaller, then "moved" into the inside of the creature and finally, in most types, disappeared completely.

And the skin of the back—which, among snails, is otherwise hidden—became the theatre of astonishing transformations. The external remnants of the spiral turning of the body have dwindled to a few obscure traces; new structures have developed, some of them highly bizarre: outgrowths, folds of skin, horns and spikes. But above all there are flowers on this new territory—if we may be permitted so to call these surfaces—an abundance of patterns and markings which are among the most astonishing developments of color in all of marine life.

Much thought and many experiments have been invested in an attempt to understand this revelation of beauty in terms of what it does for the animal. We need not tarry long over the fact that sometimes the colors of the skin provide an excellent camouflage in the forest of algae among the rocks—far more controversial is the rôle played by the lively designs which shine out in clear colors of the spectrum. Since many of these snails are inedible and are refused by fish, the markings were at first thought to be a sort of warning-color, the assumption being that the fish learns, in time, to leave such striking creatures alone. This is the way we explain the warning-effect of the black and yellow stripes on the wasp—an effect from which many far less harmful insects profit. The experimental results with our snails are contradictory. But even if such warning-effects do sometimes occur, they can result only from the conspicuousness of the markings—a conspicuousness which would characterize any bright and colorful pattern.

But the vague, general idea of a warning-effect fails to clarify precisely the process which the theoreticians would like to explain: the development of the particular pattern typical of a particular group. Confronted by many such unsatisfactory experiences in attempting to explain colored markings in the animal world, a different view is developing at the present time. This new view contributes important features to our new image of nature, and at the same time the new image of nature lends support to the new viewpoint. Since this new outlook is also concerned in ascribing to color a new rôle in the realm of living things, we must sketch it at least in outline.

The biochemist and the microbiologist are establishing in ever more precise detail the "specificity" of protoplasm, the fact that the material of a given species of plant or animal displays its particularity, its own uniqueness, in important chemical reactions and in its macromolecular structure as well. These findings are established in a realm which lies beyond the limits of our vision. They are a part of life which, in its molecular order, does not directly reach any bodily sense, and to which research has gained access only by indirect means.

While the biochemist searches the specific nature of protoplasm with all the techniques of modern research, the morphologist attacks the same problem of species specificity with other tools and on another research level, on the level of the "apparatus," the level at which living creatures form organs. The morphologist discovers the specifics of a species not only in the functional properties which preserve life but also, and far more pronouncedly, in the development of the entire form and appearance of the creature, that form in which it appears in the realm of light and by which it represents its own species. The philosophers call this appearance "the manifestation of being" and the biologists speak of "self-representation"—and this "self" is not some obtrusive ego, but rather the mysterious vital center which, in every species, governs and gives order to individual development, to the regulation of function, to the process of healing—that center of which our own consciousness, too, is a mysterious organ.

We need this detour into one of the newest phases of natural philosophy because our color problem has its own special place in the midst of this complex of questions. As long as the ruling idea was that any given structure could be maintained and further developed only via the mechanism of the selection of useful variants, so long we had to conceive of the incredible wonder of color in nature as being exclusively the work of natural selection. Within limits, this could be done in all cases where it was possible to prove that a seeing organ performed the selection; but this approach failed to explain a thousand other cases where no selection through eyes could be at work.

Among these cases—whose number is constantly growing as our knowledge increases—are the brilliant markings of our snails. They are unaddressed broadcasts—we will scarcely be able ever to find a utilitarian significance in them.

Another rôle emerges all the more clearly: that of the self-representation of a living species in special organs

which do nothing except manifest the particularity of a species in the language of structures—organs which translate the specificity of the protoplasm into a form of expression which certainly does not exist primarily as a signal to a receptive eye but which seems to us rather to be simply an end in itself. The intensive study of many such unaddressed broadcasts shows how extensively colored markings are used for self-representation, and shows also that a sizable amount of organic energy and many chemical processes and structures are invested to this end. The zoologists call the visible organs of this self-representation "phaneres"—and in recent works increased attention is paid them. The cost of such structures is tremendous in terms of developmental energy. If we were to make an account, by weighing and measuring, of the investments involved in all these functions, many of us would be astonished to learn that the peacock, to give but a single example, must each year invest a full seven months of constant growth solely in order to produce the glory of his new tail. Understandably, biochemistry has had but little interest in the chemical structures of the many types of pigments produced by animals—often by those living in comparative isolation—in the service of self-representation. And beyond these chemical processes lies that which is at present really unknown to us, that which is perhaps even inaccessible: the processes by which the distribution of the chemical colors produces patterns which, if presented without introduction to an unprejudiced judgment, might well be considered as nothing other than the intentional work of an artist. Certainly, the investigator may not derive his guiding principles from such an attitude—yet he too faces the new task of uncovering the elements which create order in living creatures, whether they are located in the cytoplasm of the germ cell or in the heritage found in the nucleus of the fertilized egg. Presumably the markings of the animals, the insects and the birds result from a complicated interactive process taking place between nuclear factors and the structures of the cytoplasm.

The search for ordering elements goes still further. Already today it is clear that the structures which subserve self-representation possess a very special character. A digestive system, a nervous system, a kidney, a heart—these are strictly grounded in the demands of a specific vital maintenance function of the organism. But when in the sea anemone the colors and markings of the crown of tentacles follow the laws of symmetry—in this case, indeed, a very complex symmetrical rule—this has nothing to do with the function of these feelers in catching their prey or in mediating stimuli; a particular style is expressed in the patterning of these markings—the style of the group, as well as that of a particular species. And when we find that on the skin-folds of snails the borders are marked with such radiant color, this characteristic is not significant in any function which serves preservation. This magical combination of colors is simple self-representation of a very specific protoplasmic being which we zoologists have called *Thuridilla splendide,* naming it after a figure in the Nordic saga, the Edda.

From the experiments with the fritillary butterfly we know that the markings are "useless." But we may not simply delete from the riches of nature some left-over pieces which we consider "impractical" or "useless" just because we find the utilitarian principle to be inapplicable outside the sphere of preservation. Therefore it was an important step beyond the exclusive validity sometimes accorded the utilitarian understanding of the life-forms, when we ceased to regard the "useless" characteristics in an isolated and negative way and began to take them seriously as elements in an important order of distinguishing life-characteristics. A part of this change was the step to a positive evaluation of the appearance of the creatures, the recognition that this is an aspect of life which must be seen as a general characteristic of all living forms. The organs of the skin, the manifold surfaces of living creatures, were previously regarded all too exclusively as protective organs which serve to isolate an "inside" from an "outside" and which in performing this function may incidentally effect some few positive relationships, such as the mediation of stimuli, or the signal-effects in social behavior, or the camouflage which aids in avoiding enemies. Today biologists are gaining a more comprehensive understanding of these surfaces.

We started out by mentioning the search for the "true essence" beneath "deceitful exteriors," and we observed that the surface of living creatures has often been regarded as a veil which hides something more real, as an appearance behind which lies the true reality.

Our way through the realm of color led us to endow the surface appearances of the organic forms with a more comprehensive significance. The organisms do not exist in order that the metabolic function may be exercised; something unknown governs the metabolic process in order that this particular organism—which ultimately is ever before us as a mystery—may be maintained for a little while. And a part of this organism is its manifest appearance, which we have called its self-representation.

Color is one of the very special instruments of this manifestation of life. Inside, color may occasionally occur as an inconsequential by-product of vital metabolic processes, but in the appearance of a creature it is used as a special possibility of form—the organisms pay a price in order to create the species-specific appearance. The biochemical expenditure, the number of specific enzymes and reactions which serve the self-representation of living things, is tremendous, and equally large is the number of physical structures whose ultimate function is the production of color. In this technological era we naturally comprehend this expenditure most easily in those structures where it

has significance in terms of preservation. But we are gradually learning that self-representation *is*, in itself, primary significance. Color is a particularly propitious tool for this purpose: it can be spread over a surface in infinitesimally thin layers, permitting the production of glorious colors and patterns without hindering the feathers of the bird or the wings of the butterfly or the fur of the mammal in their vital functions.

When color came to be utilized as a new possibility in the creation of appearance, the surfaces of the animal forms became opaque—nature began to depart from the frequent complete transparency of simpler life-forms. Only with the development of the non-transparent surface did the polarity of outside and inside develop to intense forms. Ever more the necessities of the vital functions came to dominate the "inside," the inner surfaces grew larger, the organs folded and coiled upon themselves, the original symmetry was abandoned to make possible an extreme exploitation of the spatial possibilities—the outside, however, became increasingly a theatre for the play of shape and color, this in accordance with the strict rules of species specificity.

This play of color appeared in remote times without the least relationship to eyes which might observe it, and it still appears so in some groups. In the early stages of the development of higher life this was an unaddressed appearance, and even in its highest forms, which stand clearly in relationship to sight, this unaddressed, elemental quality of patterning and color is a part of the reality of the form and must be included in the view of the investigator if our image of nature is to be a comprehensive one.

This appearance is an appearance in light. With this observation we are led beyond the rôle of color in life to the existence of the realm of light as the primal space both of color and of living things. The distribution of the living forms tells us that the lightless places in which living things are found are secondary zones of life, that the largest wealth of forms has evolved in the illumined realm, and that from a very early level of life onward the light-filled zones made possible the highest development of the organisms. Illumination as a primary fact of the original medium of life stands in mysterious and strict relation to the phenomenon of "appearance": we acknowledge self-representation of the species in the realm of light as one of the meanings of organic form—as a meaning which points beyond that of simple preservation.

Manifestation through color is inherent in the nature of the living forms. The eye is one of the miracles of life—but no less miraculous are the processes and forms found in nature which are created for seeing eyes. To the biological investigator the processes of seeing are full of riddles—but equally puzzling are the devices of self-representation which were already at hand before seeing eyes existed, and which nevertheless displayed at this primitive developmental level all those qualities which, later on, were to be particularly appealing to eyes.

When, in the great early period of impressionist painting, living as well as lifeless things were for the first time represented as pure appearance in light, some artists based this cult of color in part on their scientific insight into the nature of light. In the true sense of the word they thereby brought into a new light, for us all and for all time, a world of new beauty. But this view of nature helped also to begin the dissolution of the apparent form, even helped in forgetting the form altogether; appearances became more and more simple opportunities for the play of light and color. And yet a renewed experiencing of the world, a wealth which can never be lost, was given us by these painters: a profounder relationship to the mysterious medium of appearance. For the works of these great painters and discoverers bear true witness to the "deeds and sufferings of light" of which Goethe had spoken.

Filled with the new sense of color, contemporary research is now turning once again to the miracle of the appearing forms of nature: the invention—if we may be allowed to use such an anthropomorphic term—which made the surfaces of the creatures into bearers of special colorings, signifies for morphology not only the evolution of a theatre for the "deeds and sufferings of light": the surface is at the same time the place where the hidden essence of the protoplasm is manifest—the protoplasm to which this colored, luminous surface was given as a new possibility of communication.

Light and color are not solely problems of the physicist, which present themselves afresh to each generation. Both also involve two great biological problems—and these, too, are new for each generation: the problem of the nature of seeing, and the problem of the meaning of the forms and colors of the creatures which live in the light-filled realm. Colors are one of the mysteries of light—of light which alone gives meaning to the eye.

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Man

ERLING SKORPEN

The Whole Man

I

MAN IS SLOWLY PERCEIVING

THAT THE INNER SELF EVOLVES

AND IS FOUND AND FULFILLED

IN THE WHOLE

ALONG WITH MANY OTHER large and lasting concepts, such as truth, time, and being, the idea of the whole man comes to us from the Greeks. Consistent with the view that poets quite often originate the ideas which philosophers subsequently develop, it appears first in Homer with the advice given to Achilles "to be both a speaker of words and a doer of deeds." And Jaeger has said:

> The later Greeks were right in believing this verse to be the earliest formulation of the Greek educational ideal, of its efforts to express the whole of human potentialities. (1)

If he is right, then we can say that Plato's ideal of the philosopher-king and Aristotle's ideal of the great-souled man, which came later, were simply elaborations of this basic theme that to be a whole man one must be both a careful thinker and a courageous actor. To such a man Plato's desired justness and Aristotle's honored nobility of character would accrue naturally.

Against the mythical portrait of the poet and the abstract formulations of the philosophers, we have the palpable embodiment of such virtues in the life of Socrates, who is known to have been the immediate model for the ideals of Plato and Aristotle and, later, the Stoics. On the side of intelligence, Socrates fashioned the art of dialectical reasoning, still the distinctive and indispensable mode used to explore the meaning of our major concepts; but, unlike the Sophists, in him this art was supported on a double platform of restless desire to discover and communicate the truth and ill-disguised humility in the presence of the great issues of human existence.

On the side of action, on the other hand, he displayed not only enviable robustness in games and war, and in earthy appetites generally, but existential heroism of the kind leading to faithful enactment of the ideals he had deliberately adopted, and calm acceptance of the consequences, even when they included poverty, public disapproval, and death. It was the complete fusion of thought and action in Socrates that made it possible for him willingly to drink the hemlock—a natural outcome of the wholeness and consistency of life which he sought for himself and his fellow men.

As so exemplified, the Greek ideal of wholeness must be said to be an achievement of the first rank. It was an original conception with the Greeks and not, like many of our religious notions and practices, an outgrowth of

primitive mentality. For it was a good part of the Greek genius to appreciate for the first time that when not preoccupied or worn by toil, men may choose either to waste existence or to struggle for richer and more meaningful existence. This fateful choice was open to man, they saw, because the rigidity of physical nature did not entirely extend to human nature. On the contrary, Greek nature rebelled against the rock-like immobility and the animal-like obedience of the material and instinctual universe, and sought to wrest man from captivity in order that he might better understand himself and his place in nature.

We may not fully appreciate this achievement today, until we realize that all our present efforts to educate our young or reform our society simply take it for granted. Yet were human nature not plastic, and a bagful of possibilities for growth, such efforts would make no sense and would end in futility. This human potential is what the Greeks intuited and experimented with in so many striking ways. Now that automation is threatening or promising (depending on how you look at it) to separate men from their jobs in great numbers, thus putting the masses in the position of the privileged few, in Greek times, who did not need to toil to sustain life, the full meaning of the Greek discovery of human potentiality will force itself upon us through necessity, and with it, perhaps, the Socratic conviction that it is not affluence that matters so much as excellence.

II

If it is true that the Greek ideal of human wholeness arose more or less spontaneously, the same obviously cannot be said of the Renaissance ideal of the universal man. But this fascinating idea nevertheless was a further development of the Greek notion. In Burckhardt's fine study, *The Civilization of the Renaissance in Italy,* the following observation introduces his comments on the rise of many-sided man there:

> In the Middle Ages both sides of human consciousness—that which was turned within as that which was turned without—lay dreaming or half-awake beneath a common veil. The veil was woven of faith, illusion, and childish prepossession, through which the world and history were seen in strange hues. Man was conscious of himself only as a member of a race, people, party, family, or corporation—only through some general category. (2)

It may seem strange, even incredible, to us that up to the Renaissance men saw themselves only as members of a group without separate identity. For we think of the high culture of ancient Greece and Rome, of the Socratics and the Stoics with their emphasis upon self-examination, and wonder how they failed to grasp the implications of individuality. Yet in Plato's society men achieve identity only as members of classes distinguished by aptitudes for work, defense, and leadership. And Aristotle never does succeed in recognizing the rights of slaves to the preservation, enlargement, and enjoyment of life which he readily concedes as essential to free men. Even the Stoics could only exhort men to accept the duties of their inherited station in society, whether slave or emperor, and so achieve tranquillity. It is therefore not surprising that during the Middle Ages less sophisticated men could establish their identity only in the groupings of society and mankind; they still thought in terms of "we" and not "I." To Burckhardt's judgment in this matter Jaeger lends his support:

> Nowadays we must find it difficult to imagine how entirely *public* was the conscience of a Greek. (In fact, the early Greeks never conceived anything like the personal conscience of modern times.) (3)

In 14th century Italy, however, there begins to emerge the man who is no longer afraid, according to Burckhardt, "of singularity, of being and seeming unlike his neighbors." And for the first time in the language of Western Man expressions are to be found like *uomo singulare* and *uomo unico,* "singular man" and "unique man," which in the consciousness of the Renaissance stand for the higher and highest stages of human development. This means, then, that if it was the genius of the Greeks to wrest mankind from their collective and unthinking identity with the rest of nature, it was the genius of the Renaissance to wrest the individual or private man and his conscience from collective or public man and his conscience. And both figurative separations were important in man's progress towards self-knowledge and wholeness.

Its importance is seen in the fact that in addition to producing men capable of both intelligent thought and decisive action, this period in Italian history evoked individuals who were gifted and breathtakingly proficient in many fields. With the discovery of the private man in the 14th century, "in the following step by step," says Burckhardt, "the number of complete men increased and the ideal of *l'uomo universale* arose." This is the period of such giants as Dante, Alberti, Da Vinci, and Michelangelo —men who combined in their persons the talents of poet, philosopher, artisan, artist, scientist, engineer, architect, and even prophet.

Such men, inspired by the vision of unlimited human potentiality, labored continuously to become accomplished in the old and new ways of men at their best. We can only pause in admiration before the achievements of such geniuses as Leon Battista Alberti—superb athlete, intellectual, writer, inventor and artist—who combined all these gifts with a poet's sensitivity so acute that he shed tears of joy at the sight of dignified old men, and was actually healed of his illnesses in the contemplation of nature. Yet his superb attainments are overshadowed, as Burckhardt notes, by the still greater genius of Da Vinci,

who "was to Alberti as the finisher to the beginner, as the master to the dilettante."

In considering the great men of the Renaissance, one cannot but be struck by their power of imaginative participation in the materials of their art, which enabled them to see and feel deeply and privately into such elements of Christianity as Christ's passion, the Holy Family, the lives of the saints, and other Biblical figures, as well as the gods, men and heroic symbols of Greece and Rome. In a very authentic sense they "lived" what they depicted in their art, (4) and thus were akin to the great mystics of their period, like Meister Eckhart, who, while not universal men in the sense of horizontal diversity of development, touched universality in their vertical depth. Nor should we overlook the suggestion that the Renaissance ideal of the universal man was incomplete without that sensibility which was the deeply personalized and passionate characteristic of Christian mysticism—in contrast with the impersonal and highly intellectualized mysticism of reason's intuitive outreach to the ultimate being, the Form of Goodness, to which Plato and the Neo-Platonists aspired.

Christian mysticism, furthermore, beginning with St. Francis and Meister Eckhart, made its contribution to the discovery of the individual during the Renaissance if for no other reason than that it emphasized the meeting in direct and intimate experience of the individual and God. Eckhart was excommunicated by the Church in the 14th century not only because he had offended the sensibilities of orthodox Catholicism, but because he had asserted the validity of individual insight, even when it was in conflict with church and society.

III

When this dimension of the Renaissance ideal of the universal man is duly recognized, in the performance of men like Alberti and Da Vinci, we may wonder if the human perfection which they instanced does not represent the peak of mankind's development in both theory and practice, such that, apart from improved techniques of scientific discovery and applied technology, little else of importance distinguishes modern man from his Renaissance ancestor. Indeed, we might wonder if modern man hasn't deteriorated in comparison. But it seems that even in the case of such human paragons there was something of great consequence still lacking, that man's work with himself even in theory remained unfinished, and that the whole man envisioned by the Greeks and later the Italians was not yet whole.

Language again furnishes the clue to the deficiency. If it surprised us that terms like "singular man" and "unique man" were used in the West no earlier than the 14th century, it is no less astonishing that only after the Reformation in the 16th century does the language of Western man reflect the discovery of the modern ego and its challenging dimensions. Until then he had no words such as "self-esteem," "self-pity," "self-liking," "self-love," "self-conceit," "self-knowledge." And according to Owen Barfield in his *History of English Words,* it is such terms that begin to mirror "the shift of the center of gravity of consciousness from the cosmos around man into the personal human being himself." The European ego, the Cartesian self, only now "appears to be engaged, unawares, in disentangling itself from its environment—becoming less and less of the actor, more and more of both the author and spectator." (5)

Barfield points out that as man's attention turned inward, his feelings also became internalized. Words like "baleful," "benign," "virtuous," and "holy," which in antiquity and medieval times were applied to the external world, began to characterize human moods, attitudes and tendencies. Expressions like "baleful weather" and "evil eye" exhibited the original uses of such adjectives until, in growing self-awareness, man began to apply them to himself.

In this connection it is interesting to speculate on the significance of the discovery of man's inner world to modern science. Without the ego's recognition of itself as fertile territory for exploration, could it have put sufficient distance between itself and physical nature to supply the objectivity so vital to science? The distinction between the self and the not-self is a crucial refinement of the Greek distinction between man and nature. The willingness of the self not to intrude upon the not-self is at least part of the meaning of scientific detachment (and, we might add, of any sound appreciation of what or how things are in contrast to what or how the ego in its inflationary moods might like them to be). Perhaps the detachment is less a matter of passive spectatorship than of attentive looking and listening, but it must include the readiness to let things be what they are.

Putting this aside, let us return to the central problem of connecting the discovery of the ego with the evolving concept of human wholeness. It is just here that we come upon a turn of affairs not only intriguing, but frustrating and even terrifying. We can begin by attending to the predicament Thomas Mann found himself in when writing the story of *Joseph and His Brothers.* In the prelude he asks himself how far back in time it is necessary to locate Joseph's tale:

> Very deep is the well of the past. Should we not call it bottomless?
> Bottomless indeed, if—and perhaps only if—the past we mean is the past of the life of mankind, that riddling essence of which our own normally unsatisfied and quite abnormally wretched existences form a part; whose mystery, of course, includes our own and is the alpha and omega of all our questions, lending burning immediacy to all we say, and significance to all our striving. For the deeper we sound, the farther down into the lower world of the past we probe and press, the more do

> we find that the earliest foundations of humanity, its history and culture, reveal themselves unfathomable. No matter to what hazardous depths we let out our line they still withdraw again and further into the depths. "Again" and "further" are the right words, for the unresearchable plays a kind of mocking game with our researching ardours; it offers apparent holds and goals, behind which, new reaches of the past still open out—as happens to the coastwise voyager, who finds no end to his journey, for behind each headland of clayey dune he conquers, fresh headlands and new distances lure him on.

If in this passage we replace the word "self" for the word "past," the result expresses very well the enigma posed by the self in its voyage of inner discovery. Existentially speaking, it is the mystery of the self that "is the alpha and omega of all our questions," though the question of origins in general and of the self in particular may be inextricably bound up with the mystery. At least the problem of defining the whole man is expressed fundamentally by the question "Who am I?" The proposed alteration of Mann's passage reveals the answer as more complex than was foreseen by the Greeks and Italians. In fact, the question arises whether the classical ideal of human completeness has not always been a chimera, and whether those looking for completeness are not in the egregious position of seeking what in principle cannot be found.

IV

We can obtain better perspective on this development by following the progress of Descartes' ego since the 17th century. Descartes reached the conclusion (by means of his famous method of doubting everything that could be doubted) that man's thinking, feeling and willing soul, though definable by such characteristics, was nevertheless isolable as the pure "I am." Subsequently, David Hume strove mightily, according to his own reports, to find such a soul within himself, but he finally concluded that no such thing existed. Instead of Descartes' inner soul, he perceived only a succession of discrete thoughts, feelings, and volitions. Such detectable mental occurrences, Hume suggested, might be compared to movements on a stage, but his self-examination failed to reveal anything like a Cartesian theatre containing these movements. The "I," and hence the identity of man, was no more than this sequence of ideas, sensations and wishes. Hume's view was that the illusion of the self arises because the resemblances between distinct experiences suggest continuity, but the conveyor of this continuity is no more than memory, itself an episodic mental occurrence.

But Kant, attentive to Hume's musings across the Channel, questioned them in his turn. Just who, he asked, is it that has carried on this inner scrutiny? Who is the sorrowful spectator that concludes he is nothing more than these thoughts, feelings and wishes? Who sits before the stage and recognizes the performances on it as his and not those of another? And whose memory is at work, facilitating self-identity?

Kant, in short, was persuaded that within each man there resides a spectator capable of observing both inner thoughts and feelings and outer objects and events. It seemed to him quite clear that within each man there were two selves: the Humian association of assorted sensations, and the Cartesian self to whom such an association belonged. Kant proposed, in effect, that a kind of schizophrenic double nature was the natural condition of mankind, implicit in the very possibility of self-awareness.

Adding to the mystery of man's ultimate identity, Kant held that the Cartesian self as spectator could not itself become an object of inspection; it transcended all spectacles whether internal or external. Or, to change the metaphor, regarded as the huntsman in Hume's (and later Jung's) sense of modern man in search of a soul, the self could not become its own quarry (a proposition to which Jung agreed), for in Mann's language it is "the unresearchable playing a kind of mocking game with our researching ardours." In its way this was Kant's concession to Hume, for it explained why he could not locate Descartes' soul through introspection. The Kantian concession to Descartes, on the other hand, was that the soul was indisputably the "I am" that was both ground and source of all knowing, feeling and willing, though hidden from view and eternally mysterious. Such a compromise could not hope to please everyone, but Kant himself was satisfied that he had done justice to both points of view. He hoped that the matter of man's identity could rest there, but little did he know that he had opened up a Pandora's box.

V

What Kant could not foresee was the appeal that his schizophrenic account of man would have to such lovers of the unknown as Hegel, Kierkegaard, and Nietzsche. Instead of remaining mute, as Kant had cautioned, before the veiled presence of a self behind the self open to empirical investigation, these 19th century philosophers grew unabashedly excited over something so elusive. Not only did they see it as the ground of man's thinking, feeling, and willing, but they went on to describe it as a fund of limitless possibilities, whose mode of operation in the finite world was that of an *éminence grise* inciting human activity on all levels.

Would not such an infinite and emanating self, they conjectured, account for such things as the inexorable push of history and man's restless creativity? Was it not, in fact, the source of that longing for wholeness and fullness of existence expressed by the Greek aspiration for excellence and the Renaissance aspiration for balanced achievement? The persistence of such aspirations in man, in spite of failures and frustrations, could be understood in this light. Consequently, one could begin to say things about Kant's hidden self that Kant himself had thought impossible.

There were theoretical differences, of course, among great 19th century existentialists, but they all agreed that man contains within himself both a radical and a conservative self, the former functioning as innovator and the latter as preserver of accomplishment. For Hegel, the radical self, a modification of the Cartesian ego and the Kantian transcendental self, was the instigator of man's drive throughout history for freedom. The conservative self—the Humian and Kantian empirical self—was that which, through social involvement in family, school, industry, government, science, art, philosophy, and religion, sought to express and structure the inner self's hunger for freedom and fulfillment. For Kierkegaard, the radical self became basically the spiritual self of man, seeking its home in the infinite with God, while the conservative self embodied the various means by which this divine hunger was actualized. As for Nietzsche, the radical self became Dionysiac in its appetite for union with all being, and the conservative self Apollonian in giving form to the impulses originating in Dionysiac rapture and ecstasy.

This is an over-simplified account of the uses to which these thinkers put man's two selves, but it reveals their basic agreement and also anticipates the corollaries to this agreement. Ideally, the two selves should work together so that, in the powerful language of the existentialists, "the self is in itself what it is for itself and for itself what it is in itself." That is to say, the ideal for man's two halves is a harmonic integration which avoids such incongruities as exhibited in the man who starts out to rectify the ills of society, but ends by becoming a dictator, the philosopher who disguises himself as a physicist, and the rabbi who masquerades as a psychoanalyst. If the needs of the inner self are not adequately and faithfully expressed in the activities of the outer, then the whole man is in the crippling condition of self-alienation that Kierkegaard has called "despair," Nietzsche "neurosis," and Sartre "bad faith." The difficulty and even, perhaps, the inevitability of this condition lie in the fact that man is forever denying what he is in order to become something other. Thus the wholeness which man seeks carries its own ambiguity.

VI

Something like this conception of man's two-fold nature has taken root in contemporary philosophy, psychology and theology. We think at once of Sartre, Jaspers, Heidegger, Freud, Jung and Tillich, among others. This view is for some furnishing clues to man's metaphysical identity, for others, his theological identity, and for still others, abnormal as well as normal human development. It indeed seems to represent the third major breakthrough in Western man's search for self-understanding. The Greeks, as we have said, detached the species of man from the rest of nature, the Renaissance delineated the individual, and now it is the achievement of our own times to have distinguished the inner, radical and persisting self from the outer, active and empirical self. This achievement is enabling modern man to step back from his involvements in thought, feeling, activity, and so on, and contrast them with his fundamental hunger for fullness of being and self-understanding.

Until the discovery of the inner self and its needs, much that went into the concept of the whole man remained unexplained; with it, things are falling into place. Two points, in particular, bring out the heuristic value of this discovery. First, it has vitiated such restrictive definitions of human nature as that man is a rational animal, or that he is sexually dominated. For it is now possible to see that such drives are products of a deeper drive for fullness of being. They have importance in the sense that they are useful for man's growth, but they are not fundamental or exhaustive characteristics. And there is freedom in this insight—freedom for man to experiment in ways other than those which are rational and sexual (in the full Freudian sense, of course) in his quest for wholeness. The freedom is so heady that it has inspired Nietzsche, Sartre and others to declare that "everything is permitted" and that "man can and must create his own essence." Such outbursts are extreme, but they indicate a faith in man's unlimited potential, and they should be appreciated as joyous expressions of relief and release from the suffocating strictures placed on man's nature by psysicalist and behaviorist definitions.

In the second place, the discovery of the inner self in its relation to the outer self has provided a solution to the long-standing riddle as to how a man could find himself in the act of losing himself, or how the mystic could "unselve" himself in anticipation of his encounter with God and still be himself to enjoy and grow in the experience. The answer seems to be that the self he must lose is the web of ego-entanglements which far too often strangles the inner self, and thus prevents self-discovery and freedom for the mystical encounter. But if man can throw off these entanglements and experience the inner self, he can begin to reconstruct his outer nature in new terms which are consonant with self-knowledge and self-integration.

VII

Separation of man's two selves for purposes of understanding has considerable explanatory power. But now we should ask what the effect may be of such separation on man's aspirations for wholeness. In one respect the impact is clearly tremendous, since if man's inner self contains infinite resources, the possibility of exhausting them scarcely exists. No man will ever be in a position to complete his life's work if he has construed this work to be the actualization of his potentialities. The acquisition of such things as fame and fortune, prestige and power, in this light, can no longer be ends in themselves, but only as ways, for better or worse, of the self's hunger for fullness of being.

This consequence can be disturbing, in the way that many are distressed to find that the whole truth can never

be attained, and what remains for the truth-seeker is the never-ending quest. The elusiveness of final truth often leads to the adoption of self-defeating dogmas. It is possible that the realization that final completeness of being is also unattainable may have upon some a similar effect, driving them out of the mainstreams of life into its shallows and dried-up pools. Others, however, will be exhilarated by the notion that growth is endless, and stimulated in their own quest by the achievements of such men as Socrates, Da Vinci, and Goethe.

The wholeness of being sought in Western tradition has not, therefore, lost its validity. But the term "whole man" has become ambiguous in our time, and its new meaning must be carefully distinguished. If to the classical imagination wholeness of being meant the possibility that a man could uncover and fulfill his many gifts, as a circle or a journey might be completed, today it means something quite different. For us it must be regarded as the process of self-integration in man, so that the inner and outer are not at war, competing for different ends, but are united in the quest for fullness of being. For modern man, the alternative to such integration is disintegration, in various degrees of severity on a slippery slope from neurosis to insanity and self-destruction.

In this quest we shall do well not only to keep company with the great representatives of our species, but also to remain open to the possibilities suggested by our inner self. We should try not to blunder blindly or stupidly into ways of perversity and indulgence which do no more than squander our powers. We should venture upon the new and untried with Socratic courage, risking the disapproval of the conventional, and tolerating their accusations of eccentricity and betrayal of social norms. We should remember Kierkegaard's warning against the dangers of moral and religious conformity, and that Nietzsche added to these the dangers of making new cults of science and technology. There is also the need to restore the power of imagination and mystical sensitivity in which the men of the Renaissance excelled prior to the rise of modern science and scientific philosophy. It may well be that in our great scientists and philosophers this power has been redirected from the arts to the sciences. Where it may have been lost, however, is in the person who has chosen to rely exclusively on his senses in determining what he will allow himself to believe (what his eyes and ears tell him) and what he will desire (what his senses find pleasure in).

Thus what wholeness can be achieved by modern man must embrace the use of intelligence to direct our affairs wisely and passion to enter into them fully, and it must also include the Renaissance struggle for creative accomplishment, which is supported by imagination and not achieved by reason alone. For imagination, as Kierkegaard pointed out, is not just another of man's many faculties:

> Generally speaking, imagination is the medium of the process of infinitizing . . . . it is the faculty for all faculties. What feeling, knowledge, or will a man has depends in the last resort upon what imagination he has. . . . (6)

It is therefore eminently suited to the existential push to what is basic in reality through poetic metaphor, myth, and art—the very means which in the past have connected the old with the new.

VIII

A postscript to this wisdom from the past would be the advice that men again become listeners to the silence out of which speaks what is deepest in man and nature, and communicants of this meaning. Neither the listening nor the communicating is necessarily a new art; mystics may always have practiced it. But mystics have been few in any age, and the art seems even rarer in a machine culture characterized by incessant noise. Yet the wisdom which is touched in silence has nowhere been better described than by a man of our time, Max Picard, in *The World of Silence*:

> In silence . . . man stands confronted once again by the original beginning of all things: everything can begin again, everything can be re-created. In every moment of time, man through silence can be with the origins of all things. Allied with silence, man participated not only in the original substance of silence but in the original substance of all things. Silence is the only basic phenomenon that is always at man's disposal. No other basic phenomenon is so present in every moment as silence. (7)

Listening to the silence must be complemented by the willingness (which we earlier said was essential to the scientific attitude, and which we now generalize) to let things be what they are rather than what we think they ought to be—possibly because reality seems so threatening. It takes an act of courage we might call faith to accept life as it gives itself—a courage which embraces the willingness to engage in frank and open dialogue with others, in order to free ourselves from our conceits, misconceptions and illusions. Such a prospect should be no more terrifying than that of losing oneself in order to find oneself in the mystical sense mentioned earlier. Not to welcome this prospect and undertake the means of achieving it, consequently, is nothing more than a denial of one's self and one's future possibilities for growth. It is the meaning, again, of Sartre's "bad faith," which finds its opposite in "good faith" or the willingness to be one's real self, and not some fictitious self gratifying to the ego.

The combined readiness to listen to the silence, talk openly with others, and allow reality to be what it is (which is not to be confused with thinking that everything is perfect and not to be disturbed), may be an effective anti-

dote to immersion in the busyness of daily existence and consequent loss of identity. It may be the *sine qua non* of attaining the successful union of man's two selves, that is meant when we speak of the whole man today.

Fractured and unfinished though he be, modern man need not despair. He can work actively towards healing the fracture and completing himself, which is self-evolution. This is a "futile passion," as Sartre describes it, only in the sense that there will always be more to do. Relative to this task, Heraclitus remarked more than two thousand years ago that "It is the kind of man you become that is your fate." Only two decades ago, Camus said, that "There is no greater work of art for man to create than himself." And in the immortal image of man's soul given by Plato, man is like a charioteer drawn by two winged horses (his infinite and his finite selves?); if he can keep them abreast of one another, he may actually ascend to the realm of the gods.

Somehow all these images point to the same thing.

Notes

1. Werner Jaeger, *Paideia: The Ideals of Greek Culture,* 2nd. ed., Oxford, 1945, p. 8.
2. Jacob Burckhardt, *The Civilization of the Renaissance in Italy,* Macmillan, 1921, p. 129. All other references to Burckhardt are from pages immediately following.
3. *Op. cit.,* p. 9.
4. For an illustration of this phenomenon, see Mircea Eliade, *Myth and Reality,* Harper and Row, 1963, p. 19. Also see Owen Barfield, *Saving the Appearances,* Faber, 1957, in which he discusses the notion of "participation."
5. Owen Barfield, *History of English Words,* Faber, 1954, p. 166-7.
6. Soren Kierkegaard, *Sickness Unto Death,* Doubleday Anchor Book, 1954, p. 163.
7. Max Picard, *The World of Silence,* Gateway Book, 1961, p. 6. Hugh L'Anson Fausset's *Fruits of Silence,* Abelard-Schuman, 1963, is comparable.

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The Enigma of Human Nature

GARDNER MURPHY

SOME NEW DIMENSIONS WHICH ENLARGE OUR STUDY OF MAN

THERE ARE THREE FAMILIAR QUESTIONS in which we are wont to frame our ignorance of human nature. The first is, Where does man come from? Second, How does he reflect or mirror the universe of which he is a part? And third, what are the boundaries that separate a man from the world?

Our lack of any ready answers to these questions, or indeed of any real knowledge about man, may be exemplified by something which James Harvey Robinson said while he was working on what he called "the history of the human mind," portions of which were published in his fine book, *Mind in the Making*. Robinson described the confidence with which eighteenth-century man contemplated his own position. For instance, in the *Decline and Fall of the Roman Empire*, Gibbon said that, after millennia of confusion, man had at last settled down to rationality, freed from violence and disorder, and that he could clearly and quietly plan in peace. This statement, of course, was made by Gibbon just before the outbreak of the French and American Revolutions.

Then Robinson went on to discuss a latter-day point of view, expressed by H. G. Wells in his *Outline of History*, (1920) which might be called the attitude of the nineteen-twenties. His position was that man at last was able to command the whole sweep of cosmic evolution. Through the contributions of Laplace and others, the derivation of the planetary system and indeed the whole history of the cosmos lay open to view. And of course, following Darwinian theories of the proliferation of life on this planet, it could be clearly shown that man, in close affinity to the other primates, reflected the basic problems which living creatures always present. In the same way, Robinson pointed out, we had, by the nineteen-twenties, learned to understand the principles of literary criticism and, above all, Biblical criticism, so that "Revelation" need appear no more as a stumbling block in the way of rationality. Again, through the attainment of an understanding of economic and political life, and the amazing development of cultural anthropology, we were able, according to Robinson, to see man as he really is.

It seems hard to believe that only slightly more than thirty years have passed since this quiet confidence about man was formulated, only to be thrown into confusion by the following generation. How little of what Robinson taught us in the early twenties can we say as confidently today. How little that Gibbon knew so surely can be certain for us of the nineteen-fifties. We seem to be facing a pace in discovery so great that it scarcely permits any assimilation. We have to un-learn so much that we knew about man that we wonder if we shall have the strength and the time and the skills for a fresh attack.

The problem might be stated in this way: What are the implications of the new dimensions in which we now study man? Suppose we ask a simple question, such as: what is *inside* man? For even a basic physiological study, the field of inquiry has changed to an extraordinary degree. In his *Politics*, Aristotle says, "Most things are known. The problem is to apply what we know." Today we must realize that before we can say we know anything about what is inside man we must have at our command lens and microscope, both unknown to Aristotle, which open up to us infinitely complex cellular and atomic structures of which neither he nor the men of the eighteenth century had any suspicion.

Can we assume, from the strides recently made in knowledge, that we are getting into a period of diminishing returns, so that within a few more years we can say with justified confidence that we know what is inside man? Unfortunately, if we look at the problem from another point of view, the functional, it becomes more and more complex. It is only a little over a half-century since Sigmund Freud developed his conception of the unconscious and so began to carry forward some of the great insights of the ancient world about the nature of consciousness. His contribution gave a new dimension to our problem, by suggesting that a large part of what is inside man he cannot know, because he fears to know.

We now begin to glimpse the question in terms of a panorama that is far greater than our own present ability to view it. The whole vast realm which constitutes the dy-

namics of the human unconscious—including motivation, conflict, symbolization, the schema of what man is and what he aspires to be—is opening out before us. It is such a tremendous vista, and extends so far beyond the limitations of present knowledge, that we cannot help looking back upon those past generations who felt so securely that they *knew*, as quaint and naive, if not pathetic.

But there are still other dimensions to this problem of man. Through tracer techniques of radioactive elements, we are beginning to study, not only content-wise but also process-wise, the intricate complexities of the chemical realities which underlie life. And we are beginning to glimpse some ways in which the psychological dynamics of the unconscious may be related to the fascinating bioelectric phenomena that go on all the time within the tissues.

In the same way, the time dimension has recently taken on a strange new form. This is partly because the span of life on the earth, and of the earth's existence, has been materially stretched in the last few years. But I am referring here more particularly to the way in which the structure of time has been "filled in." This again has become possible to us through studies of radioactivity. It is possible now to take a Geiger counter to the American Southwest and with it determine quite exactly the age of many a fossil remnant, by a study of the uranium decomposition series, the process by which uranium gradually degenerates into lead. It has also been discovered recently that the same sort of thing can be done for human history with radio-carbon. As a result of these extraordinary developments, it is now possible, for example, to date an event in Central American or European history to within just a few years. It is also possible to supply all sorts of cross-checks, such as the age of peat-bogs or the distribution of pollen, that define the exact period in which a famine or a pestilence occurred.

President White of Mills College has suggested that by these means much of the motivation of past generations can become suddenly clear to us. With a knowledge of psychoanalysis on one hand, and better dating techniques on the other, we can now cross-check some of the unconscious factors about which we could only guess, and that very timidly, even a few years ago. Thus historical man can become vivid for us as we begin to perceive his psychological realities.

Sometimes these new dimensions also begin to break down barriers which separate one person from another. As taught two or three generations ago, there was scarcely anything more dogmatic than the concept of the self-sufficiency of the individual man. It was assumed (erroneously, as we now know) that Darwinism required acceptance of a highly egocentric struggle for existence, which implied, in the age of the Industrial Revolution, a high degree of individual competitiveness. This was widely interpreted to mean the war of all against all.

A great deal of work being done today disproves this kind of theorizing from Darwinian premises. Studies of gregarious living at many animal and bird levels, of primary social organization and of more complex societies, have begun to show us new aspects of the so-called law of self-preservation which hitherto had been overlooked.

I can illustrate this point by an example at the human level. My friend, Hans Lukas Teuber of New York University, is making a study of men who have suffered perforating wounds of the brain resulting in permanent brain-tissue losses. A great many of these, nonetheless, are able to handle their lives effectively; they are not psychotics, nor have they lost heavily in intelligence levels. Although they carry around in their bodies the marks of this accident of war, they are eager to understand themselves and others. Faced with the problem of conducting an intimate psychiatric and psychological study of the perforating wound, in terms of our understanding of brain organization and function and of total personality, one would assume that it might be difficult to find two hundred men with this disability who would give their time to the investigation without compensation, and indeed with some financial loss to themselves. In terms of the classical theories of human nature, only some important egocentric motives would induce these men to undergo this considerable hardship and inconvenience. Yet Teuber has found by long experience that the way to get these men is to make it clear to them that they can be of real help to other men who, in a brain-injured state, may ultimately benefit from new knowledge.

The fact that, under such conditions, men lend themselves freely, for the single reason that they want to benefit their fellows, seems to indicate the possibility that we "knew" something about human nature that was not so. The definition of the individual man, encapsulated and sharply divided from his fellows, may well have basically missed the most important point in the human equation.

To take another instance, many people thought that Gandhi was essentially impractical, and that his prescriptions for village industry were unrealistic and contrary to the spirit and tempo of a world geared to large-scale industrial production. Yet one cannot fail to be impressed by the achievements of Vinobe Bhave, the great prophet of Gandhian philosophy, who has proceeded on just the same assumptions that govern the work of Hans Lukas Teuber. It is his simple belief that if one asks in the name of good will, men will respond in that same spirit. Thus he gives the poor Indian peasant, who has perhaps an acre or two of land, the privilege of sharing what he has with those less fortunate. And the poor peasant gives with the greatest generosity. The human heart readily responds to the opportunity, freely and spontaneously given, to be of help to another.

Instances such as these compel us to reconsider the nineteenth and early twentieth century assumptions about the encapsulated human being. The question involves not only

the divisions between persons, which may not be so sharply defined as we sometimes think them, but also the capsule walls between the person and the cosmos as a whole

The cosmos may be thought of as a "physical system," if so desired, although, in view of the difficulty we now find in making a clear distinction between what is material and what is psychical, or spiritual, I myself am inclined to doubt whether I—or anyone else, for that matter—really knows very much about what these contrasting terms are supposed to convey. But even if we accept the cosmos as a physical system and nothing more, the relationship of man to that system is becoming steadily more fluid. A prophetic statement made by Henri Bergson in *Creative Evolution* could be regarded as a sort of prediction of what has happened. Bergson said that the brain and eye of the man who is watching the farthest nebula form one organic unit with that nebula. In reality there is no such thing as the object stimulating the person and the person being stimulated by the object; one flows to meet the other.

Contemporary physics has widely employed concepts of this kind; more recently, biology and now psychology have been forced to their use through the discovery of such prin ciples as isomorphism—literally, the "presence of identical forms." This means, in effect, that the very form or structure of the cosmos is duplicated in man, in the sense that the wave-motion, or other time-space order, within cosmic structure is duplicated in miniature within the individual. The living organism is a sort of "harmonic," a reduplication of, or resonance with, vaster forces which he can perhaps only hope to know as he sees his own nature expressed more grandly in larger space-time terms.

Just where this passes over from a sober scientific statement of fact into an expression of ecstatic union or mystical belief, I cannot pretend to say. But I would feel fairly confident in stating that the microcosm which is man receives its law or structure from a more general law; that it is repeating, like the sympathetic vibration of a wire, the vaster processes of the macrocosm, and that it is perhaps capable of telling us, through its own inner rhythms, something about the larger rhythms of which it is a replica.

If we could be at once both bold and cautious, we might somehow find that human evolution, considered in terms of past, present and future (quite unlike Bertrand Russell's ideas about man's protest against the universe) is essentially a reiteration of the basic oneness of human development.

There is a good deal of reason to suspect that the nineteenth century's argument was, essentially, that the way we understand a human being is to study his clothing, because by so doing it ought to be possible to find out what kind of a living thing could occupy those clothes. Nineteenth century German and British mechanism was derived to a considerable extent from the theory that life can be understood by comprehending how material forces are organized within the cell. Today the position is almost completely reversed, for it now looks much more as though the process of cell organization, which is itself attuned to cosmic organization, determines to a considerable extent how the matter is to be used.

In case this seems a mystical view, I might remind you that serious-minded physicists and biologists are expressing just this concept. To illustrate, I might cite the remarkable papers written by Spemann, the embryologist, and von Bertalanffy, the biologist, who are responsible respectively for what is known as Field-theory in Embryology and the Theory of the Open System.

Spemann, and his pupil Paul Weiss, held the view that it is not very fruitful to study the laws exemplified in embryology through the separate bio-electric processes, such as ionization; that the way to understand these particular physical processes is rather by seeing what the cell, or even the whole body, is doing. They were able to show that the development of foetal life can be best understood by assuming that the maternal and foetal bodies are in some respects a single unit. That is to say, there is a reciprocity so intimate that it is more realistic and more accurate to treat the living system-of-two, rather than one-plus-one individuals. A further study of the separate organ systems within the embryo showed that the regions in which the foetal eye or ear develop, for example, are constantly being impressed by life forces as wholes. Thus if a group of undifferentiated cells, which could become almost anything, is planted in the eye-region of the embryo, they will turn into eye tissue; if they are planted in the ear-region, they become ear tissue. The phenomenon would almost smack of the miraculous were it not a demonstration that the laws are constant, from the larger aggregate to the more particular.

Now is this, other than verbally, dissimilar from the proposition that cosmic structure determines, in considerable measure, the nature of organic structure? Or is it very different from the thesis I have been groping to express, that the nature of man may be seen more and more intimately as a replica of larger forces? Therefore, if we are intellectually honest, we will seek the clue to cosmic forces in a fuller understanding of the way in which this duplication is effected. Since we know more about ourselves, in some respects, than about spiral nebulae, it is possible that we may gain some conception of cosmic structure by assuming that the large and the small partake of the same basic order.

If this is true, it would also seem to suggest that in our response to one another there is more than social reciprocity involved. To this point von Bertalanffy contributes his principle of the open system, which may be briefly stated as follows: Given the ordinary exchanges of energy, the tendency of the universe is to run down. The principle of entropy suggests that there is ultimately a degradation of energy into the form of heat, with a final levelling process, or condition of maximum entropy, in which the universe would consist of nothing but an even, dead distribu-

tion of heat-energy, at a temperature not much above absolute zero. But according to von Bertalanffy, this concept is basically alien to the point of view of the biologist, who has to regard a living system as capable of producing and growing within itself forces which *increase* the amount of organization. As Bergson maintained fifty years earlier, this is a creative process, but now, on the basis of more detailed and accurate information, the idea can be carried further, to show that this creative activity is the very nature of the primitive life-process itself. The concept of the open system really means that living things are not only intent on their own growth and development, but that they are directing evolutionary processes in accordance with a dynamic which is organismic, rather than mechanical.

Another contribution has been made to this overall organismic view, this time from the area of psychology. Kurt Lewin, the founder of field-theory in psychology, did some brilliant studies of what he called Group Dynamics. Lewin's work showed that there are all sorts of social processes which can be understood much better by grasping the dynamics of the whole, and then working towards the individual, than by proceeding the other way around. One of his many experiments, which had to do with the way in which housewives might make their contribution to the war-effort, will serve as illustration.

The problem was to persuade housewives in wartime to serve their families various unpopular cuts of meat, to replace the scarcer items. Lewin found that it was relatively easy for an expert nutritionist to convince the housewives that the cuts could be prepared palatably, and a public-opinion poll showed that the women agreed they would try them. However, another poll, taken two weeks later, showed that they had *not* done so.

Nevertheless, there was another method which could be tried. This time the nutritionist acted as a "resource person." She did not deliver a persuasive lecture, but instead asked the housewives to discuss among themselves what they would like to do. In their discussion, they freely and spontaneously determined upon certain innovations, and thus a group commitment was made. Another poll, taken two weeks later, showed that many of the women were really carrying out the studies upon which the group agreement had been made.

All these experiments—of Lewin and Hans Lukas Teuber and Vinobe Bhave—seem to suggest that in some yet unexplained fashion man is more completely himself when he is not completely himself, when he has in part lost his personal identity within a larger whole. I do not myself know how much poetry or mysticism and how much science are contained in this idea. I merely want to present the problem, which needs to be wrestled with honestly and without prejudice, for no possible conclusion can be reached until we have perceived some of the subtleties and difficulties which are involved.

It is obvious that this point leads directly into the area of religious experience. If we study the cases given in Bucke's *Cosmic Consciousness,* we find that they are studies of a few dozen men and women, scattered throughout history and through many cultures, who have all had similar experiences. Although they described it variously, they all testified that the experience was greatly beyond the "I." Yet when the person "came to himself" again, returned, as it were, to his encapsulated individuality, there continued to remain for him the possibility of a kind of hook-up with the tremendous experience, an increased interest or awareness in something beyond himself.

The people who nave had these de-personalized experiences are not particularly rare. From casual inquiry, I think that at least three or four out of each hundred modern American men and women have had experiences of this sort, at least on a small scale. What does this imply? At the least, I think, as William James has said, that consciousness is not limited to that personal variety with which psychology is ordinarily concerned. There may well be an infinite variety of modes of consciousness, of which self-awareness is only one. These experiences may range from the most sublime to the most chaotic. At one extreme there are people like Plotinus, with his tremendous vision of the One, and at the other the most pathetic, disoriented schizophrenics, who are hardly capable of maintaining human existence, much less claiming a perennial vision.

The question at issue is whether these experiences can throw some light on the basic problem which we raised initially, namely, whether there is a sharp boundary between individuals, and between the individual and the cosmos, or the whole. I would agree that the problem of a biochemical boundary is very different from the problem of the boundary of the self. In fact, the latter may be nothing more than a convenient device, whereby it is possible for us to be aware only of those aspects of our own individuality which are needful to us at a given time. It might also be true that we are constantly in a sort of throbbing interchange with unknown aspects of ourselves, with other human beings, and with various cosmic processes, which we lack the subtlety to understand or the language to describe. We must keep our minds open as regards the meaning of these de-personalized experiences whatever they be called—mystical, psychical or paranoid. Perhaps, as James suggested in his chapter on "Religion and Neurology," in *The Varieties of Religious Experience,* classifying these experiences in terms of sanity and insanity will get us nowhere. It is possible that value-judgments regarding human aspirations are independent of medical judgments as to problems of pathology, although this seems rather far to go.

In all this discussion it will be perceived that I have been attempting to throw together a number of lines of thought which would suggest very tentative answers to the three questions which have been raised. To reiterate these, the first concerns human origins, and in this connection I have

suggested that these origins do not stop with guesses as to how life began on this planet, but involve larger questions of the nature of cosmic structure. I have intimated that these problems might be basically the same, except in scale. This has led us on to the second question, which concerns the nature of human consciousness, and here I have tried to show that there is a sort of mirror within the individual, by which he might be able to see himself in the light of cosmic structure, and cosmic structure in the light of his own being. Third and finally, in considering the boundaries that separate us as individuals one from the other, and as humans, from the cosmos, the suggestion has been that these are often less sharp than we imagine.

If we pursued this problem further, we might conceivably arrive at some such point as the poet William Watson defined in his paradoxical phrase:

"Magnificent, out of the dust we came;
And abject, from the spheres."

It might turn out that there are two origins of man: one related to what we would ordinarily call material structure, and another, of different origin. However, most contemporary thought suggests that what we are concerned with is a unitary rather than a dual structure; that it is probably matter *and* spirit, rather than matter versus spirit, cosmos and human, rather than cosmos versus human.

But I would not have the arrogance to talk to you on such a topic as this if I felt that the answers were crisp and clear and easily identified. Rather, I think that the search for these answers will engage our children, and theirs, and perhaps on through the life and work of still other, following generations. Of these easily challenged areas of human knowledge, we never quite know, when we get off onto some lunatic fringe, when we may suddenly find ourselves emerging into the full-fledged higher lunacy. We almost never have the full assurance that we are not treading on that which is too alien to common sense to be covered with equanimity.

My own feeling is that a very large part of what is true is ridiculous. The very nature of human discovery has become so standardized, so easily available, that the true is often considered to be that which can be readily tested by the crudest and simplest techniques. Yet there are lines of investigation which stretch out, into, and around the data of empirical knowledge, and which challenge the good faith and good sense of our every-day assumptions.

While I do not want to give major emphasis to this point, I would like to illustrate it from the field of psychical research, or parapsychology, whose evidence, I believe, reinforces and confirms much that I have already discussed.

In recent issue of *Science*, published by the American Association for the Advancement of Science, Dr. George Price made the point that it is impossible to talk sanely and reasonably about events which are not ordered in terms of matter, time, energy, space, and the other basic concepts of physics. The great objection to the experiments in parapsychology is that we seem to be dealing with events which literally transcend space. For instance, the recent book by S. G. Soal and F. Bateman, *Modern Experiments in Telepathy*, published by the Yale University Press in 1954, represents about a dozen years of faithful planning, experimentation, and working-up of data which indicate the capacity of some individuals to catch and record impressions of pictures being observed by other persons, under conditions clearly precluding the ordinary spatial interpretations. In these experiments, the sender and the receiver are not only in different rooms; there is one extensive series of high scores in which they are on opposite sides of the English Channel. The studies have been elaborately safeguarded, with A watching B and C watching D, and a system of cross-checks which precluded even a group of three or four people from faking a result, because half a dozen others would also have had to be in on the trick. This book is a good example of the kind of tightly-controlled experimental research now available in the field of parapsychology.

If this kind of study indicates a trans-spatial reciprocity, then it requires a much greater extension of the idea that there are no sharp boundaries of the human individuality. For example, Soal has reported some extraordinary data, known as divided agency. In this experiment, two persons, A and B, working independently, transmit material to a third person, C. Neither A nor B knows the whole story. A may know where a certain picture lies, but not what it is, whereas B knows what the picture is, but not where it lies. In order to record, C must have some access to the minds of both A and B, in order to know where to look, and then what to see. Yet C can do this to some degree.

Some of the Soal data likewise indicate a capacity to indicate material which will be randomly chosen at a point in the future, which appears to suggest a trans-temporal, as well as a trans-spatial, mode of function. To carry forward the idea of the person as no longer sharply encapsulated, I should like to offer a third term which I prefer: "trans-personal." This implies the frame of reference which closely defines a particular individual as being in just this particular place and time may be inappropriate as a way of describing some human reality.

To conclude, I am basically asking a great deal of you. I want you to double your doubts, to ask yourselves what you really know, to challenge even those most confident liberal and humane beliefs which most of us are sure we have a right to entertain. Finally, I want to persuade you to look forward to a very long period of uncertainty as to the meaning of this great enigma, which is human nature.

Gardner Murphy was with The Menninger Foundation. The preceding paper was given as the Colloquium Address at the May 1956 meeting of the American Unitarian Association, in the First Church, Boston, Mass.

BROTHER DAVID, MOUNT SAVIOUR MONASTERY

A Deep Bow

People often ask me how Buddhists answer the question: "Does God exist?"

The other day I was walking along the river. The wind was blowing. Suddenly I thought, Oh! the air really exists. We know that the air is there, but unless the wind blows against our face, we are not aware of it. Here in the wind I was suddenly aware, yes it's really there.

And the sun too. I was suddenly aware of the sun, shining through the bare trees. Its warmth, its brightness, and all this completely free, completely gratuitous. Simply there for us to enjoy.

And without my knowing it, completely spontaneously, my two hands came together, and I realized that I was making gassho. And it occurred to me that this is all that matters: that we can bow, take a deep bow. Just that. Just that.*

—Rev. Eido Tai Shimano

GRATITUDE AS THE ROOT OF A COMMON RELIGIOUS LANGUAGE

IF WE WERE ABLE to experience this fundamental gratitude at all times, there would be no need to talk about it, and many of the contradictions that divide our world would at once be resolved. But in our present situation, talking about it might help us at least to recognize this experience when it is granted to us, and give us courage to let ourselves down into the depth which gratitude opens up.

We can begin by asking ourselves: "What happens when we feel spontaneously grateful?" (It is, of course, this concrete phenomenon which concerns us here, not any abstract notion.) For one thing, we experience joy. Joy is certainly there at the basis of thankfulness. But it is a special kind of joy, a joy received from another person. There is that remarkable "plus" which is added to my joy as soon as I perceive that it is given to me by another, and necessarily another person.

I can treat myself to a delicious meal, but the joy will not at all be the same as if someone else treats me to a meal, even though it be a little less exquisite. I can prepare a treat for myself, but by no means of mental acrobatics can I be grateful to myself; there lies the decisive difference between the joy that gives rise to gratitude and any other joy.

* From a recent address by the Rev. Eido Tai Shimano, a Japanese Zen Master who teaches at the Zen Studies Society in New York.

Gratitude refers to another, and to another as person. We cannot in the full sense be grateful to things or to impersonal powers like life or nature, unless we conceive of them in some confused way as implicitly personal, super-personal, if you wish.

The moment we explicitly exclude the notion of personality, gratitude ceases. And why? Because gratitude implies that the gift I receive is freely bestowed, and someone who is capable of doing me a favor is by definition a person.

A joy, even though I receive it from another, does not make me grateful unless it is meant as a favor. We are quite sensitive for the difference. When you get an unusually big piece of pie in the cafeteria, you may find yourself hesitating for a moment, and only when you have discarded the possibility that this may indicate a change of policy or an oversight, you take it to be a favor worthy of a smile for the fellow that hands it to you across the counter.

It may be difficult in a given case to say whether the favor I receive was meant for me personally. But my gratitude will depend on the answer. At least the favor must be meant for a group with which I am personally identified. (When you wear a monks' habit you not infrequently receive a bigger piece of pie or some other unexpected kindness from someone you never met before and whom you will never meet again. But there, the people do mean you, in so far as you are a monk, and it is quite a different case from the painful experience of smiling back at someone only to discover that the smile meant not you but someone who stood behind you.)

Where does this little phenomenology of gratitude lead us? That much we can already say: gratitude springs from an insight, a recognition, that something good has come to me from another person, that it is freely given to me, and meant as a favor. And the moment this recognition dawns on me, gratitude too spontaneously dawns in my heart: "Je suis reconnaissant"—I recognize, I acknowledge, I am grateful; in French these three concepts are expressed by one term.

I recognize the special quality of this joy: it is a joy freely granted to me as a favor. I acknowledge my dependence, freely accepting as a gift what only another, as other, can freely give to me. And I am grateful, allowing my emotions fully to taste and to express the joy I have received, and thus I make it flow back to its source by returning thanks. You see that the whole man is involved when he gives thanks from his heart, from that center in which the human person is one: the intellect recognizes the gift as gift; the will acknowledges my dependence; the emotions, like a sounding board, give fullness to the meolody of this experience.

The intellect recognizes: yes, it is true, this joy is a free gift; the will acknowledges: yes, it is good to accept my dependence; the emotions resound in gratitude, celebrating the beauty of this experience. Thus, the grateful heart, experiencing in truth, goodness and beauty the fullness of being, finds through gratitude its own fulfillment. This is the reason why a person who cannot be wholeheartedly grateful is so pitiful a failure. Lack of gratitude always indicates some malfunctioning of intellect, will or emotions which prevents the integration of the personality thus afflicted.

It may be that my intellect insists on suspicion and does not allow me to recognize any favor as favor. Selflessness can not be proved. Reasoning about another person's motives can only take me to the point where mere intellect must yield to faith, to trust in the other, which is a gesture no longer of the intellect alone but of the whole heart. Or it may be that my proud will refuses to acknowledge my dependence on another, thus paralyzing the heart before it can rise to give thanks. Or it may be that the scar tissue of hurt feelings no longer allows my full emotional response. My longing for pure selflessness, for true gratitude, may be so deep and so much in discrepancy with what I have experienced in the past that I give in to despair. And who am I anyway? Why should any selfless love be wasted on me? Am I worthy of it? No, I am not. To face this fact, to realize my unworthiness, and yet to open myself through hope to love, this is the root of all human wholeness and holiness, the very core of the integrating gesture of thanksgiving. However, this inner gesture of gratitude can only come to itself when it finds expression.

Expression of thanks is an integral part of gratitude, no less important than the recognition of the gift and the acknowledgement of my dependence. Think of the helplessness we experience when we do not know whom to thank for an anonymous gift. Only when my thanks are expressed and accepted is the circle of giving and thanksgiving closed and a mutual exchange established between giver and receiver.

However, the closed circle is not a well-chosen image for what happens here. We could rather compare this exchange to a spiral in which the giver receives thanksgiving, and so becomes himself receiver, and the joy of giving and receiving rises higher and higher. The mother bends down to her child in his crib and hands him a rattle. The baby recognizes the gift and returns the mother's smile. The mother, overjoyed with the childish gesture of gratitude, lifts up the child with a kiss. There is our spiral of joy. Is not the kiss a greater gift than the toy? Is not the joy it expresses greater than the joy that set our spiral in motion?

But notice that the upward movement of our spiral signifies not only that the joy has gown stronger. Rather we have passed on to something entirely new. A passage has taken place. A passage from multiplicity to unity: we start out with giver, gift and receiver, and we arrive at the embrace of thanks expressed and thanks accepted. Who can distinguish giver and receiver in the final kiss of gratitude?

Is not gratitude a passage from suspicion to trust, from

proud isolation to a humble give and take, from enslavement to false independence to self acceptance in that dependence which liberates? Yes, gratitude is the great gesture of passage.

And this gesture of passage unites us. It unites us as human beings, for we realize that in this whole passing universe man is the one who passes and knows that he passes. There lies our human dignity. There lies our human task. The task of entering into the meaning of this passage (the passage which is our whole life), of celebrating its meaning through the gesture of thanksgiving.

But this gesture of passage unites us in that depth of the heart in which being human is synonymous with being religious. The essence of gratitude is self acceptance in that dependence which liberates; but the dependence which liberates is nothing else but that religion which lies at the root of all religions, and even at the root of that deeply religious (though misguided) rejection of all religions.

When we look at the great rites of passage which belong to man's oldest religious heritage, the religious significance of gratitude becomes clear to us. In recent years anthropologists and scholars of comparative religion have made much of these "rites de passage," rites celebrating birth and death and the other great hours of passage through the human life. Sacrifice in one form or another belongs to the core of these rites. And this is understandable, for sacrifice itself is the prototype of all rites of passage.

The moment we take a closer look at the basic features common to the various forms of sacrificial rites, we are struck by the perfect parallel between the structure of gratitude as a gesture of the human heart and the inner structure of sacrifice. In both cases a passage takes place. In both cases the gesture rises from the joyful recognition of a gift received, culminates in an acknowledgement of the receiver's dependence on the giver, and finds its accomplishment in an external expression of thanks which unites giver and receiver, be it in the form of a conventional handshake of gratitude, or in a sacrificial meal.

Think, for example, of the sacrifice of first fruits, almost certainly the most ancient sacrificial rite. Even where we find it in its simplest and most primitive form the rite clearly displays the pattern we discovered. Let us take, for example, the Chenchu, a tribe in Southern India, belonging to one of the most ancient cultural strata not only of India but of the whole world. What happens when a Chenchu returning from a food gathering expedition in the jungle casts a choice morsel of food into the bush and accompanies this sacrifice with a prayer to the deity worshipped as mistress of the jungle and of all its products? "Our mother," he says, "by your kindness we have found. Without it we receive nothing. We offer you many thanks."

Thousands of similar rites have been observed among the most primitive peoples. But this example (recorded by Christoph von Fuerer Haimendorf, who did field work among the Chenchu) stands out for its crystal clear structure. Each sentence of the simple prayer accompanying this offering corresponds, in fact, to one of our three phases of gratitude. "Our mother, by your kindness we have found": the recognition of a favor received; "without it we receive nothing": the acknowledgement of dependence; and "we offer you many thanks": the expression of gratitude which makes the original joy over the favor received rise to a higher level.

And what the prayer expresses under three aspects, the rite expresses in one gesture: the hunter who offers a piece of his quarry to the deity expresses thereby that he appreciates the goodness of the gift received, and that through the symbolic sharing of the gift he somehow enters into communion with the giver.

So striking, in fact, is the correspondence between social gestures of gratitude and religious gestures of sacrifice that one might tend to mistake the food offerings of the Chenchu and similar examples for a mere transposition of social conventions into a religious key. However, there is no simple dependence of the one on the other. Both are rooted in the depth of the heart, but they expand in two different directions.

Man's religious awareness comes to itself through the very gesture of his sacrificial rites, just as his awareness of human solidarity comes to itself when one man expresses his thanks to another.

Man looks at life and sees that it comes to him from a Source far beyond his reach. He looks at life and sees that it is good—good for him; and from the firm ground of these two intellectual insights the heart dares to leap to a third insight which surpasses mere reasoning: the insight that all good comes to me as a free gift from the Source of Life. This leap of faith surpasses the groupings of the intellect, because it is a gesture of the whole man, very much like the trust I put in a friend.

Now, the moment I recognize life as a gift, and myself as recipient, my dependence is brought home to me, and this confronts me with a decision: Just as in the social sphere I can refuse to acknowledge, and lock myself up in the loneliness of pride, so in the religious dimension I can adopt a stance of proud independence towards the very Source of Life. And the temptation is strong to close my eyes to the ridiculousness of this posture. For dependence in the religious context implies more than the give and take of human interdependence; it implies obedience to a Being greater than I. And my petty pride finds it hard to swallow this.

(It is here, incidentally, that the violence of many sacrificial rites has its root. We cannot do justice to this aspect now, but we may note in passing that violent sacrificial rites are meaningful as an expression of that violence which we must do to ourselves before our hearts, enslaved by self-will, can enter into the freedom of loving

obedience.) The man who kills an animal in sacrifice expresses by this rite his own readiness to die to everything that separates him from the goal of this rite of passage. Since the goal is union between the human and the divine, a union of wills must precede it; the human will must become obedient. But the death of self-will is only the negative aspect of obedience; its positive aspect is man's birth to true life and joy. Upon the immolation follows the joy of the sacrificial banquet.

We should not overstress submission when we speak of obedience. Of much greater importance is the positive aspect: alertness for the secret signs pointing the way towards true joy. (I call them secret signs because they are intimately personal hints, in moments when we are most truly ourselves.) "We, unlike birds of passage, are not informed," says Rilke in his *Duino Elegies.* Our passage is not predetermined by instinct. All we are given are inklings like that stirring of gratitude in our hearts, and the freedom to follow these inklings.

To the extent to which we have forfeited this freedom, detachment is necessary. Obedience is our alertness, our *disponibilité,* our readiness to follow the homing impulse of the heart in its upward flight. Detachment liberates the wings of our heart so that we can rise to the grateful enjoyment of life in all its fullness. We must open our hand and let loose what we hold before we can receive the new gifts which every moment offers us. Detachment and obedience are merely means; the goal is joy.

If we would understand moral sacrifice in this positive way we would also understand ritual sacrifice which is its expression. Neither of the two is that grim thing into which it is sometimes distorted. The pattern of both is the passage of thanksgiving. The accomplishment of both is the joy of man's union with that which transcends him. This is expressed in the sacrificial banquet in which the rite of sacrifice culminates. This joyful meal presupposes the acceptance of man's thanksgiving by the divinity. It is the embrace which unites the one who gave the gift and the one who gives thanks for it.

(Let us remember, by the way, that in the religious context, God is always the giver: man is the thanks-giver. Only in the far less original context of magic can this relation deteriorate to some sort of commercial transaction or even to man's effort to extort favors from super-human powers. But magic and ritualism are dead-end roads of the heart; they do not concern us here.)

What does concern us is the fact that our own experience of gratitude is closely related to a universal religious phenomenon, to sacrifice, which lies at the very root of religion. And once we have grasped the root we can find access to religion in all its aspects. The whole history of religion can, in fact, be understood as the working out in all its implications of that sacrificial gesture which we ourselves experience as often as gratitude rises in our hearts.

Jewish religion, for example, begins with the implicit conviction that man would not be man unless he offered sacrifice, and leads up to the explicit awareness that "only one who brings himself as sacrifice deserves to be called man." (Rabbi Israel of Rizin; died 1850) We have a perfect parallel in Hinduism where an early Vedic text sees man as "the one animal capable of bringing sacrifice," (*Satapata Brahmanah* VII, 5, 2, 23) and the development culminates in a passage from the *Chandogya Upanishad* (III, 16, 1): "Verily, a person is a sacrifice." Does not our own experience show us that a human person finds his own integrity only in the sacrificial gesture of thanksgiving?

And even to the "thou shalt love" (which is in one form or another the mature fruit of every religion) does our experience of gratitude give us access. But just as the root repelled us at first by its apparent crudeness, so this fruit of religion makes us draw back from the contradiction it seems to contain. How can love be commanded? How can there be an obligation to love? Love is not love at all unless it is gratuitous. What we experience in the context of gratitude provides us with a clue: a favor we do to another remains a favor, remains gratuitous, even though our heart tells us that we ought to do it, that we ought to be generous, ought to pardon. And why? Because we belong together in a deep solidarity which the heart discerns. We belong together, because together we are obligated to a reality which transcends us.

Christ's word comes to mind: "If you are offering your gift at the altar, and there you remember that your brother has something against you, leave your gift there before the altar, and go. First make peace with your brother, then come and offer your gift." (*Mt.* 5:24) This is in perfect conformity with the tradition of Israel's prophets who insisted that true sacrifice is thanksgiving, that true immolation is obedience, that the true meaning of the sacrificial meal is mercy, "hesed," the convenant, love, which binds men to one another by binding them as one community to God.

What is rejected is empty ritualism, not ritual. Thanksgiving, mercy, obedience are not to replace ritual, but to give it its full meaning. Indeed, man's whole life is to become a sacred ritual of thanksgiving, the whole universe a sacrifice. When the prophet Zachariah says that "on that day" (the day of the Messiah) "every pot and pan in Jerusalem and Judah shall be sacred to the Lord of hosts, so that all who sacrifice may come and use them," the implication is that there is nothing on earth that cannot become a vessel filled with man's gratitude and lifted up to God.

It is this universal "Eucharistia," this cosmic celebration of a thanksgiving sacrifice which forms the heart of the Christian message. And even to those of us who are not Christians the experience of gratitude gives at least a speculative access to the Christian belief that the spiral of thanksgiving is the dynamic pattern of all reality, that within the absolute oneness of the triune God there is

room for an eternal exchange of giving and thanksgiving, a spiral of joy. Within the one and undivided Godhead, the Father gives himself to the Son, and the Son gives himself in thanksgiving to the Father. And the Gift of Love eternally exchanged between Father and Son is himself, personal and divine, the Holy Spirit of Thanksgiving.

Creation and redemption are simply an overflow of this divine "perichorese," this inner-trinitarian dance, an overflow into what of itself is nothingness. God the Son becomes the Son of Man in obedience to the Father, so as to unite through his sacrifice in merciful love all men with one another and with God, leading them back in the Spirit of Thanksgiving to that eternal embrace in which "God will be all in all." (1 *Cor.* 13, 28) "Whatever exists, exists through sacrifice." (*Sat. Brah.* XI, 2, 3, 6) The whole cosmos is being renewed moment by moment through sacrifice: brought back to its source through thanksgiving, and received anew as gift in all its primordial freshness. But this universal sacrifice is possible only because the one God, himself, is Giver, Thanksgiver, and Gift.

To those among us who have entered into this mystery through faith it need not be explained; to others, it cannot be explained. But to the extent to which we have given room in our hearts to gratitude, we all have a share in this reality, by whatever name we may call it. (It is a reality which we shall never fully take hold of. All that matters is that we let it take hold of us.) All that matters is that we enter into that passage of gratitude and sacrifice, the passage which leads us to integrity within ourselves, to concord with one another and to union with the very Source of Life. For "... this is all that matters: that we can bow, take a deep bow. Just that, Just that."

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LAMA ANAGARIKA GOVINDA

The Problem of Past and Future

FREEDOM,
WHICH CONCERNS THE FUTURE,
IS MADE POSSIBLE BY KNOWLEDGE
OF LAW, WHICH IS THE
ACCUMULATION OF THE PAST

BOTH TIME AND SPACE are the outcome of movement, the characteristic of life, from its highest spiritual manifestations down to the simplest physical phenomena. By intellectually separating time from space, and both of them from the experiencing subject, we arrive at an abstract concept which has neither vitality nor reality. In order to imbue it with a semblance of movement, we divide it into past, present and future, out of which neither the past nor the future seem to possess actual reality. The present, however, according to this division, is merely the dividing line between the past that is no more and a future which is not yet: it is a point without extension, without dimension, and therefore without the possibility of movement. Yet we feel the present as the most real aspect of time, the only point in which movement is possible.

Consequently some modern thinkers try to cut through the Gordian knot by declaring that there is no time and that the only solution to the riddle of life consists in living exclusively in the present, treating the past and the future as non-existant and illusory. In this way they arrive at their concept of spontaneity as the only true principle of life, forgetting that spontaneity is built on practice; in other words, that it is a product of long repeated actions in the past, actions that have been carried out consciously and deliberately over a long period, and which have become so ingrained in one's nature that they need no further decision or effort of will.

The wonderful instincts of animals (which by far outdo our cleverest logical operations) are based on this accumulation of past experience, and the same holds good of the human genius, the man of unerring "spiritual instinct" (which we call "intuition"), or the virtuoso, whose technical perfection is the fruit of years of intensive practice, and whose accomplishments have become part of his subconscious or unconscious nature. In spite of popular belief, a genius does not fall from heaven—except from the heaven of his own making. Even the Buddha, according to Buddhist tradition, had aeons of practice on the Bodhisattva Path behind him, before he became a Buddha, a Fully Enlightened One. In the same way we have to assume that children who display extraordinary faculties and accomplishments, before they had a chance to acquire them through education or training since their birth, can only have acquired them in a pre-natal existence. "The mechanistic theory of heredity," as J. S. Haldane says, "is not only unproven; it is impos-

sible. It involves such absurdities that no intelligent person who has thoroughly realized its meaning and implications can continue to hold it." Science is unable to explain the astonishing feats of child-prodigies who—as, for instance, Mozart or Beethoven—could master complicated musical instruments and the even more complicated and subtle laws of musical composition. Mozart composed minuets at the age of four, while Beethoven had composed three sonatas even before he had reached this age. To explain this through the hereditary factors and combinations of chromosomes is as unconvincing as explaining the human mind as a product of the brain. The brain is as much a product of the mind as the chromosomes are a product of forces about whose nature we know as little as what we call gravitation, light or consciousness. The more we try to reduce the world into a play of cause and effect instead of seeing the infinite interrelationship of all phenomena, and each individual as a unique expression and focalization of universal forces, the further we get from reality.

However, even if we admit that all the powers and faculties of the universe are within us, unless we have activated them through practice or made them accessible through training they will never become realities that influence our life. They will neither appear nor materialize effectively if we merely rely on the potentialities of our "unconscious mind," as the mediocre products of modern worshippers of the "unconscious" amply demonstrate in all fields of art and thought.

Just because the depth-consciousness (which I think is a better term than the "unconscious") contains an unlimited wealth of forces, qualities and experiences, it requires a well-ordered, purposeful and trained mind to make use of this wealth in a meaningful way, i.e. to call up only those forces, contents of consciousness or their respective archetypal symbols which are beneficial to the particular situation and spiritual level of the individual and give meaning to his life. "A more perfect understanding of the dynamic potentialities of the unconscious would entail the demand of a stricter discipline and a more clearly conscious direction," as Lewis Mumford said in his review of C. G. Jung's *Remembrances.*

As a reaction against the over-intellectualization of modern life, the chaotic excesses of certain modern artists and writers may be understandable, but as little as we can live by the intellect alone, can we live by the "unconscious" alone. Nothing of cultural or spiritual value has ever been produced in this way.

Those who think that any conscious effort or aspiration is a violation of our spontaneous genius, and who look down upon any technique or method of meditation or the fruits of traditional experience as below their dignity, only deceive themselves and others! We can be spontaneous and yet fully conscious of the forms and forces of tradition. In fact, all culture consists in a deep awareness of the past. Such awareness, however, should not be confused with a clinging to the past or with an arbitrary imitation of its forms of expression; on the contrary, full awareness and perfect understanding free us from the fetters of the past, without thereby losing the fruits of our former experiences. We do not free ourselves from our past by trying to forget or to ignore it, but only through mastering it in the light of higher, i.e. unprejudiced knowledge.

If we allow the past, undissolved and undigested, to sink into the subconscious, the past becomes the germ of uncontrollable — because unconscious — drives and impulses. Only those things which we have perfectly understood and consciously penetrated can be mastered and can have no more power over us. The methods of healing employed by modern psychotherapy as well as by the most ancient meditation-practices are based on this principle. Even the Buddha attained his Enlightenment only after having become conscious of his complete past. This past, however, included the past of the whole universe. By becoming conscious of it, he freed himself from the power of hidden causes.

Ignorance is bondage, knowledge is liberation. So long as we are ignorant of the causes of the past, we are governed by them, and in so far they determine our future. The course of our future is "predestined" only to the extent of our ignorance. "Fate is a very real aspect of our lives as long as we remain in ignorance, as real as the other aspect of freedom. What we call fate is the pulling and moulding of our lives from sources of which we are unconscious. Where there is the Light of consciousness all is freedom; wherever *to us* that Light does not penetrate is Fate. To the adept *Siddha* whose consciousness enfolds the whole range of manifested being there is no fate at all."[1]

Genuine meditation is an act of opening ourselves to that Light; it is the art of invoking inspiration at will, by putting ourselves into a state of intuitive receptiveness, in which the gates of the past and the present are open to the mind's eye. But unless the mind's eye is cleared of the dust of prejudice and selfishness, it will not be able to grasp the meaning of its visions, to assess their value or importance and to make use of them. Two people may hear the same symphony: to the musically untrained or uncultured mind it will be a mere noise, to the cultured or musically receptive it will be a revelation, an experience. Even the grandest and most sublime vision conveys nothing to the ignorant, or something that may be thoroughly misleading. (Herein lies the danger for those who use trance-inducing or consciousness-transforming "psychedelic" drugs like Mescalin, LSD or the like, without having the knowledge or the critical faculty to judge or to evaluate the resulting phenomena and experiences.)

When I spoke about the gates of the past and the present, which are opened in introspective meditation, I

did not mention the future. Neither did the Buddha when describing the experiences of his Enlightenment. Why was that so? Because the future is essentially contained in the past and focalized in the present.

Jean Gebser, one of the most creative and stimulating thinkers of modern Europe—whose philosophy is the gigantic attempt to integrate the most advanced knowledge of our time with the spiritual sources of the past—defines evolution as the unfoldment in time and space of something that is already potentially existent in its essential features, though indeterminable in its individual realization. The manner in which we accomplish this individual realization is the task of our life and the essence of our freedom, which latter consists in our choice either to cooperate with the laws of our universal origin and to be free, or to ignore and to oppose them, and thus to become the slaves of our own ignorance.[2] The more we recognize this our origin, the more we are able to cooperate with it and thus with the universal law (*dharma*) of our inherent nature. And likewise: he who perceives the outlines of the past can recognize or foresee the structure of the future. Their similarity is such that most clairvoyants are unable to distinguish between them, as confirmed by research-scholars, like Alexis Carrel, who says with regard to clairvoyants: "Some of them perceive events which have already happened or which will take place in the future. It should be noted that they apprehend the future in the same way as the past. They are sometimes incapable of distinguishing the one from the other. For example they may speak at two different epochs of the same fact, without suspecting that the first vision relates to the future and the second to the past."[3]

This, and other similar statements, have been taken by some people as proof that the future exists in the same sense as the past, namely as an accomplished fact, hidden only to the limited faculties of perception of our human mind. But certain clairvoyant experiences, of which a striking example was reported by a well-known research-scholar (the mathematician Dunne, as far as I remember), seems to contradict this view. It is the well-authenticized story of a man who, after having bought a ticket for a sea voyage, dreamt that the boat on which he was travelling caught fire and sank. He saw vividly all the details and his own part in the events, such as his efforts to save himself and others from the impending doom. The dream was so overwhelmingly real that he returned the ticket. A short time later he read in the papers that the steamer, on which he had booked his passage, had met with a disaster and that the things had happened exactly as he had dreamt—except with regard to his own person! If the future event had been unalterably fixed or existed in some "timeless dimension," he could not have changed his decision and escaped the impending fate.

What is foreseeable are probably certain general conditions, under which the future events take place, and these general conditions have as much stability or constancy as a landscape through which we drive. If we know the speed of our movement and the road or the direction which we want to take, we can safely predict where we shall be at a certain future time and what landmarks we shall have to pass on the way. This then is not because it exists in a future dimension of time, but because we move in a certain direction under already existing conditions, or more correctly, conditions whose rate of change is so much slower than our own movement that we can regard it as a constant and, in this sense, existing factor. Once we move in a certain direction, we are bound to meet certain events. But whether we move or not, and which direction we choose, this lies in our hand—provided we have the knowledge to foresee the results of our actions. This knowledge can only come from the past, from the remembrance of past experiences.

Here the question arises, whether the future is a real quality of time or merely a mental projection of the past into the opposite direction.

We can think of the past without reference to the future. But we cannot think of the future without reference to the past. If an astronomer can predict future events with accuracy, it is because of his knowledge of the past movements of heavenly bodies, from which he deduces certain universal laws. These laws are, in other words, the sum total of the past in its timeless aspect, in its ever-present potentiality, in the actuality of the present moment.

The past is ever present, but due to the momentariness and limited range of our ordinary individual consciousness (or rather that part of it which we use in our everyday life)—which can dwell only on one point at a time, and which therefore has to be in constant motion in order to cover a wider range of events, facts, or objects—due to this momentariness we experience only that one point as present, on which our mind is focussed, and all other points as past (or, according to our expectation, as future). If we could see all the points simultaneously, the past would appear as another dimension of space.

Rainer Maria Rilke, perhaps the greatest mystic poet of our time, wrote in one of his letters:

> It appears to me more and more as if our ordinary consciousness were inhabiting the top of a pyramid, whose basis within us (and, so to say, below us) broadens out to such an extent that the further we are able to descend into it, the more widely included seem to be those data of earthly and universal existence which are independent of time and space. Since my earliest youth I have felt the probability (and I have also lived accordingly, as far as possible) that in a deeper cross-section of this pyramid of consciousness, the simple fact of being could become an event for us, that pure presence and

simultaneous existence of everything, which in the "normal" upper apex of self-consciousness, one is able to experience as a "successive process." To hint at a (human) figure who would be capable of perceiving the past as well as the things that have not yet arisen, as ultimate presence, has been an urge with me when writing my *Malte*, and I am convinced that this view corresponds to a real state, though it may contradict all conventions of our actual life.[4]

The aspect of "being" is nothing other than the total aspect of becoming. There is no question of choosing between these two aspects, as to which is the more real or true. Both are ever united, and those who try to build a philosophy upon only one of them, to the exclusion or negation of the other, lose themselves in verbal play. Even if time, as we understand it, is an imperfect way of seeing things, the movement on which it is based and the consciousness which perceives it are real factors of immediate experience and profound significance.

If time is movement, and movement is not merely mechanical motion but an autonomous expression of individual life, then the future is not something already existing (or existing in an absolute sense), but evolving out of the pattern of individual movements. Even if the sum total of all these movements amounts to something like an eternal "Body of Reality" or whatever we may call the ultimate state of transcendental quietness, harmony and completeness, for which the Plenum-Void of *Sûnyatâ* is perhaps the most adequate expression—the fact remains that each individual pattern has its own meaning and justification, and this consists in an unalienable experience of freedom, without which no individual life would be possible or would have been able to come into existence.

Though in the average sentient being this freedom may consist only in an infinitesimally small part of his conscious activity, it is sufficient to break the rigidity and monotony of mechanical law. Even if from the individual pattern of behavior, the patterns of future events can be foreseen with a high degree of probability, we have to admit that probability is not certainty, not unalterable law, but merely the way of least resistance. The degree of probability becomes higher the more we are concerned with the general aspect of things or events, and lower the more we are concerned with the individual aspect. As Jung has said,

> The more theory lays claim to universal validity, the less capable it is of doing justice to the individual facts. The statistical method shows the facts in the light of the ideal average but does not give us a picture of their empirical reality. While reflecting an indisputable aspect of reality, it can falsify the actual truth in a most misleading way. This is particularly true of theories which are based on statistics. The distinctive thing about real facts, however, is their individuality. These considerations must be borne in mind whenever there is talk of a theory serving as a guide to self-knowledge. There is and can be no self-knowledge based on theoretical assumptions, for the object of self-knowledge is an individual—a relative exception and an irregular phenomenon. Hence it is not the universal and the regular that characterize the individual, but rather the unique.[5]

This uniqueness is not a contradiction to the basic universality of the individual, but a focalized expression of that universality at a certain moment of time and in a certain spatial relationship to other phenomena of the universe at that moment. On the universal scale everything appears as law, on the individual scale law dissolves into mere patterns of probability. Law is the general frame in which individual movement, individual life, takes place. Just as a picture gets its meaning, i.e., becomes a "picture," because it is related to a frame, so freedom has meaning only within the framework of or with reference to law.

Law, however, is the accumulated, crystallized past, the conscious as well as the unconscious memory, the sum total of past events or movements (or "emotions"), which in the individual condenses itself into form-tendencies which we call "character." But since character is not something different from the individual, but that in which individuality consists, we cannot separate these two concepts and play the one out against the other by saying that because an individual acts according to his character, therefore there is no freedom of action. On the contrary, if an individual were forced to act against his character, he would be unfree. Freedom is neither waywardness nor lawlessness, but the expression of one's inner law. Freedom and law do not exclude each other (as little as the picture excludes the frame or the frame the picture). Though the frame imposes a limitation on the picture, it strengthens it at the same time. In a similar way laws, though imposing limitations upon our freedom, not only strengthen it, but make it possible. Freedom consists in the right application of laws, in making the right use of them, and this depends again on the degree of our knowledge or insight into the nature of things*, i.e., into our own nature. It is only there that freedom can be found. To express one's own inner law, one's character, in one's actions, is true self-expression, and self-expression is the hallmark of freedom. Freedom, like all spiritual realities, is one of the great paradoxes of life, and like life itself it is beyond proof or logical definition.

The problem of freedom is closely bound up with the problem of the future. If the future were something exist-

* Even our freedom to handle and to utilize material things depends on the stability of mechanical or physical laws.

ing, in the same way as the past, there would be neither freedom nor meaning in the unfoldment of individual life, no responsibility for our actions, no moral or ethical values: life would be reduced to the clockwork of a mechanical process which runs its course to an inevitable end or in an endless circle of blind necessity or predetermined action. No system of thought that believes in ethical values and ultimate freedom or liberation through individual effort and a certain measure of free will and insight, can subscribe to such a view. The Buddha himself rejected this fatalistic outlook of pure determinism in his emphasis on self-reliance and in his condemnation of Makkhali Gosala's doctrine of predestination (*Samaññaphala Sutta* 20).

The Buddha treated the past as an unquestionable fact, the present as the decisive time-element, but he never speculated about the future. Though he often spoke about the past, of previous existences as well as of previous world-cycles and of the Buddhas of the remote past, he never indulged in prophesies. This in itself is significant and shows that the past and the future cannot be treated on the same footing, or as possessing the same degree of reality.

Since time and space are the two inseparable poles of the same reality, we should expect a parallelism of their structure. But do the three dimensions of space correspond to similar three dimensions of time? Obviously not; because if we divide time into past, present and future, then the present is not a dimension at all, but the incommensurable point which separates the past from the future. Nor can we say that the past and the future are opposite dimensions; they are one and the same movement, pursuing the same direction. If the past and the future would constitute movements in quite different or opposite directions, we would be justified in calling them different dimensions.

But time is movement in one direction only, and has therefore only one dimension, as indicated by the phrase, "three dimensions of space and one of time," which latter, therefore, has also been called "the fourth dimension." Of this question (which we shall consider in a subsequent essay), Alexis Carrell had this to say:

> On the surface of our planet those dimensions are discerned through particular characteristics. The vertical is identified by the phenomenon of gravity. We are unable to make any distinction between the two horizontal dimensions. As for the fourth dimension, or time, it takes on a strange aspect. While the other three dimensions of things are short and almost motionless, it appears as ceaselessly extending and very long.[6]
>
> No concrete thing has only three spatial dimensions. A rock, a tree, an animal cannot be instantaneous. Indeed we are capable of building up in our minds beings entirely described within three dimensions. But all concrete objects have four. And man extends both in time and in space. To an observer living far more slowly than we do, he would appear as something narrow and elongated, analogous to the incandescent trail of a meteor. Besides he possesses another aspect, impossible to define clearly. For he is not wholly comprised within the physical continuum. Thought is not confined within time and space.[7]

NOTES

1 Sri Krishna Prem, *The Yoga of the Kathopanishad* (London: John Watkins, 1955), p. 66.

2 "To speak of a renunciation of free will is not only unnecessary but wrong. We do not live without the freedom of decision, because our whole life consists primarily in our remaining faithful to the decisions which we have once made in the invisible and in full freedom. What is felt as renunciation represents itself merely as a transposition from the visible into the invisible. As a decision arrived at in the past it became valid for our present life; and that constellation in which this happened is at the same time our innermost core which rests in our deepest being and is thus our constant companion." (Jean Gebser, *Der unsichtbare Ursprung* [The Invisible Origin], Olten and Freiburg, Walter-Verlag, 1970. p. 35.) Gebser's monumental work, *Ursprung und Gegenwart* (Origin and Presence) appeared in two volumes at Deutsche Verlagsanstalt, Stuttgart, in 1953 and 1966, and unfortunately has not been published in English translation.

3 *Man the Unknown*, p. 156 Alexis Carrell.

4 *Briefe von Muzot*, p. 291.

5 C. G. Jung, *The Undiscovered Self*, Mentor Books, p. 17.

6 Alexis Carrell, *op. cit.*, p. 165.

7 *Ibid*, p. 156.

Lama Anagarika Govinda is one of the world's leading scholars and interpreters of Tibetan Buddhism. The preceding article continues the discussion of space and time from the point of view of Mahayana Buddhism which was begun in "The Conception of Space in Ancient Buddhist Art and Thought" (26, 3, Jan.-Feb. 1970) and in "Time and Space and the Problem of Free Will." (26, 4, March-April 1970). These will be gathered together in a forthcoming book, to be entitled Dimensions in Consciousness.

BHIKKU ÑĀNAJĪVAKO

Karma—The Ripening Fruit

I

THE CONTINUING EXPLORATION OF THE IDEA OF PROCESS HAS DISCLOSED THAT HUMAN BEING CARRIES ITS DESTINY WITHIN ITSELF

WITH THE DECLINE OF NEWTONIAN PHYSICS and the emergence of quantum theory and relativity, the physical world-picture in the West became centered around a *process-concept*. Natural sciences and 19th century scientifically oriented philosophy were in quest of new criteria that could be better adjusted to their specific aims than the rude causal interpretation of the whole world, "with its men and gods" (as the Buddha would say) in bare analogy to "dead matter" in its macroscopic common-sense aspect. This was the end of the stiff mechanistic absolutism based on the *substance-view*, and the corresponding conception of causality as the universal pattern of blind determinism in nature. The dominant role of physics was about to be replaced by a prevalently biological orientation. This at least was the tendency of the new vitalistic philosophy, whose most preeminent representative was Henri Bergson.

By this essential turning, modern philosophy seemed to return to pathways that closely, though not explicitly, resembled certain specific features of Buddhism, which have arisen out of different contexts and much earlier in time. The first to advert to this analogy explicitly, in terms of a new philosophy of culture, was Friedrich Nietzsche. The idea of the "eternal recurrence" of cosmic and historical cycles, taken over from early Greek philosophy, was not sufficient for his dynamic "transvaluation of all values." Yet the way from the early Ionian world-view to the Indian heritage in the dissolving civilizations of the Near East—out of which ultimately the Ionian Renaissance had arisen—was not very long. Thus Nietzsche discovered in the teaching of the Buddha an archetypal model for his own vitalistic attitude in philosophy. His interpretation of Buddhism became a paradoxical counterpoint accompanying Nietzsche's antithetic position to Christianity.

Despite its rather strange position in the structure of Nietzsche's own thought, his interpretation of Buddhism is neither vague nor unauthentic. Nietzsche found his access to Buddhism through the basic text of *Dhammapadam* (probably Fausböll's masterly Latin translation of 1855, the first in Europe). In Chapter I, 5, the Buddha is quoted as saying: "Enmities are never appeased by enmity, but they are appeased by non-enmity. This is the eternal law." In Nietzsche's interpretation, this statement is "the moving refrain of the whole of Buddhism ... and quite rightly: it is precisely these emotions [of ressentiment] which would be thoroughly *unhealthy* with regard

to the main dietetic objective," since Buddhism "no longer speaks of 'struggle against sin' but, quite in accordance with actuality, 'the struggle against *suffering*.'" Suffering is in Nietzsche's existential interpretation "a state of depression arisen on the basis of *physiological* conditions: against this depression Buddha takes hygienic measures." The Buddha was a "deep physiologist, whose 'religion' should more properly be called a *hygiene* ... whose effect depends on the victory over ressentiment: to make the soul free from it—this is the first step towards health. "Enmity is not ended by enmity ...'—this is not a moral advice, this is an advice of physiology."[1]

As brutally partial as this interpretation may seem even to Buddhists, it nevertheless singled out an essential point whose deeper implications will remain characteristic for the development of the later philosophical thought on the main subject of the present paper.

On the other hand, at the end of the 19th century, and also much later, missionaries of more popular versions of Buddhism, still unaware of the essential purport of the new scientific and philosophical world-view emerging in their own cultural ambience, were praising Buddhism for its eminently rational advantages as a religion founded on the "solid scientific basis" of the universally valid "principle of causality," almost in its Newtonian meaning. For at that time the term *paticcasamuppādo*, or "interdependent origination" of all phenomena (*dhammā*) used to be interpreted in analogy to the "hard facts" of physics and physically oriented "positive" sciences. This understanding of the principle of causality seemed sufficient to account for the generally Indian teaching on *karma*, the basic principle of moral determinism, and for its peculiarly Buddhist version, distinguished by the Buddha's negation of a permanent soul-principle (*anattā*) in the *process* of becoming visualized as a "stream" (*samsāra*) of life-experience, and corresponding most closely, as we shall see, to Bergson's *flux du vécu*.

It seems that at that time, and for a long time after, nobody except Nietzsche was interested in taking note of another humble historical fact, namely that the Buddha's attitude to the world as a whole was emphatically negative: *sabba-loke anabhirati*, "disgust with the whole world"—not only because the world, whose overlord is Death (*Māra*), is essentially anguish or suffering (*dukkham*), but also because the deeper reason for this existential anguish is the "nullity" (*suññam*) of our-self-being-in-the-world, or "nihilation" as we might express it in 20th century terms:

> ... since in this very life such a being [as the Buddha] cannot be identified by you as existing in truth, in reality, is it proper for you to state that such a being is the superman, the most excellent man who has attained the highest aim, and that such a being, if he has to be designated, should be designated in other than these four terms: "Such a being exists after death"; or "he does not exist after death"; or "he both does and does not exist after death"; or "he neither does nor does not exist after death"?
>
> Surely not, reverend sir.
>
> Good, Anuradho. Both formerly and now, it is just suffering that I proclaim, and the ceasing of suffering.[2]

II

In the oldest Buddhist texts of *abhidhamma* ("about phenomena"), the central conception of phenomenological analysis (*vibhajjavādo*) was concentrated on the idea of a "stream of existence" (*bhavaṅga-soto*): articulation (*aṅgam*) of the existential (*bhavo*) flux (*soto*), or, in a free translation, emergence of fluctuating articulation. Thus, in early Buddhism as in modern philosophy, "substance-thought" had to be replaced by "process-thought." Long before the Buddha, substance-thought was formulated in the Vedantic conception—contained, among so many other world-views, in the earliest *Upanishads* as the teaching of an absolute, all-encompassing being, *Brahman*, conceived as "changeless, all-pervading, unmoving, immovable, eternal." In negating all these attributes, the Buddha challenged Vedantic absolutism by adopting the alternative solution of resolving all "being" into flux and nullity (*suññatā*), in negating even a permanent or static soul-principle (*anattā*, or the negation of *ātmā*, the Vedantic Self).

Thus the core of the *abhidhamma* conception of the "stream of existence" consists in its theory of momentariness (*khaṇikavādo*). Its modern analogy has found its first and best formulation in the philosophy of William James, especially in his essay, *Does "Consciousness" Exist?*, where the "stream of consciousness" or "stream of thinking" (which, "when scrutinized, reveals itself to consist chiefly of the stream of my breathing") is elicited from his basic theory of "pure experience," defined as "the instant field of the present ... this succession of an emptiness and fullness that have reference to each other and are of one flesh"—succession "in small enough pulses," which "is the essence of the phenomenon." In the same connection, as "the result of our criticism of the absolute," the metaphysical and metapsychical idea of a "central self" is reduced by James to "the conscious self of the moment."[3] Compare this with Whitehead's further elaboration in his metaphysical conception of "actual occasions" and "throbbing actualities" understood as "pulsations of experience," whose "drops" or "puffs of existence" guided by an internal teleology of their "concrescence" (analogous to the Buddhist *saṅkhārā* in karmic formations) join the "stream of existence."[4]

All this was summarized by Bergson in a statement which to a Buddhist sounds like a formulation in the

simplest and most authentic terms common to all schools and periods of Buddhist thought:

> There are changes, but there are underneath the change no things which change: change has no need of a support ... movement does not imply a mobile.[5]

In his introduction to the French translation of *Pragmatism* by William James, Bergson says that "from the point of view taken by James, which is that of pure experience or of 'radical empiricism,' reality ... flows without our being able to say whether it is in a single direction, or even whether it is always and throughout the same river flowing."[6] And in his own *Introduction to Metaphysics*, he says, "All reality is, therefore, tendency, if we agree to call tendency a nascent change of direction."[7]

Bergson's approach to a biologically oriented philosophy of life was entirely different from Nietzsche's intentions. He did not explicitly consider cultural implications of the biological reorientation of the new philosophy of nature until the last period of his activity (*The Two Sources of Morality and Religion*, 1932). Bergson's most important work, *Creative Evolution*, which appeared in 1907, begins with the question, "What is the precise meaning of the word 'exist'?" The answer, at the end of the first section is:

> We are seeking only the precise meaning that our consciousness gives to this word "exist," and we find that, for a conscious being, to exist is to change, to change is to mature, to mature is to go on creating oneself endlessly.[8]

In such maturing and "creation of self by self," which "is the more complete, the more one reasons on what one does,"[9] consists the *problem of freedom*. In this process, each individual self-consciousness "lives and develops itself as an effect of its own hesitations until a free action is detached from it as if it were an overripe fruit."[10]

The Buddha also speaks of the guidance, or protective care, "of self by self" in the same process of "the ripening fruit of action," thus, "One oneself is the guardian of oneself. What other guardian would there be?" (*Dhammapadam*, 160)

> —if, Ananda, there were no *kamma* [*karma*, action] ripening in the sphere of sense existence, would there appear any sensual becoming?
>
> — Surely not, Lord.
>
> — ... and wherever the action ripens, there the individual experiences the fruit of that action, be it in this life, or in the next life, or in future lives.
>
> — The results of kamma are unthinkable, not to be pondered upon.[11]

Here is Bergson's explanation of the thesis:

> What are we, in fact, what is our *character*, if not the condensation of the history that we have lived from our birth—nay, even before our birth, since we bring with us prenatal dispositions? Doubtless we think with only a small part of our past, but it is with our entire past, including the original bent of our soul, that we desire, will and act. Our past, then, as a whole, is made manifest to us in its impulse.... From this *survival of the past* it follows that consciousness cannot go through the same state twice. Our personality, which is being built up each instant with its accumulated experience, changes without ceasing.... That is why our duration is irreversible.... Thus our personality shoots, grows and ripens without ceasing.[12]

Bergson's conception of causality and motivation departs from the classical theories of determinism and freedom of action, and approaches the Indian (not exclusively Buddhist) idea of *karma* in two essential points: its psychological origin and its creative character. It is based on Bergson's critique of both mechanistic and finalistic theories in biology:

> Evolution will thus prove to be something entirely different from a series of adaptations to circumstances, as mechanism claims; entirely different also from the realization of a plan of the whole, as maintained by the doctrine of finality.... Such a philosophy of life ... claims to transcend both mechanism and finalism, but ... it is nearer the second doctrine than the first.[13]

> As for this second doctrine, Bergson maintains that the finalistic interpretation, such as we shall propose it, could never be taken for an anticipation of the future.... How could we know beforehand a situation that is unique of its kind, that has never yet occurred and will never occur again? Of the future, only that is foreseen which is like the past or can be made up again with elements like those of the past. Such is the case with astronomical, physical and chemical facts, with all facts which form part of a system in which elements supposed to be unchanging are merely put together, in which the only changes are changes of position.... But an original situation, which imparts something of its own originality to its elements..., how can such a situation be pictured as given before it is actually produced? All that can be said is that, once produced, it will be explained by the elements that analysis will then carve out of it. Now, what is true of the production of a new species is also true of the production of a new individual, and, more generally, of any moment of any living form.[14]

Compare the simpler statement of the Buddha, with strict reference to the karmic, i.e. the morally relevant, act:

> If any one were to say, "this person commits an act and he *will* suffer accordingly"—if that were the case, there would be no [use of leading a] life of holiness, and there would be no opportunity of putting an end to suffering. If any one were to say: "this person commits an act for which he *deserves* to suffer accordingly"—if that were the case, there would be a use of leading a life of holiness, and there would be an opportunity of putting an end to suffering.[15]

The vitalist attempt to re-examine the problems of causality, finality and freedom of will, from Bergson's standpoint of "transformalism"[16] brought us to a wider epistemological problem of establishing adequate relations between science, history and philosophy—a problem extensively discussed by the later philosophies of existence:

> *Science* can work only on what is supposed to repeat itself.... Anything that is irreducible and irreversible in the successive moments of a *history* eludes science. To get a notion of this irreducibility and irreversibility, we must break with scientific habits which are adapted to the fundamental requirements of thought, we must do violence to the mind, *go counter to the natural bent* of the intellect. But this is just the function of *philosophy*.[17] Modern science is the daughter of astronomy; it has come down from heaven to earth along the inclined plane of Galileo, for it is through Galileo that Newton and his successors are connected with Kepler.... Each material point became a rudimentary planet.... Modern science must be defined pre-eminently by its aspiration to take time as an independent variable.[18]

> But to the artist who creates a picture by drawing it from the depths of his soul, time is no longer an accessory.... The duration of his work is part and parcel of his work. To contract or to dilate it would be to modify both the psychical evolution that fills it and the invention which is its goal. The time taken up by the invention is one with the invention itself. It is the progress of a thought which is changing in the degree and measure that it is taking form. It is a vital process, something like the ripening of an idea.[19]

Compare with this the statement of Buddhaghosa, in *Atthasālinī*: "By time the Sage described the mind, and by mind described the time."[20]

The "scission" of *intellect* from *intuition*[21] is explained by Bergson (and later existentialists) by the "practical nature of perception and its prolongation in intellect and science"; we could almost say, by the *lack of contemplative interest* in modern, technically oriented science. Thus, in a deduction which reminds us of Heidegger's basic thesis on the scope of metaphysics, Bergson formulates the question:

> But has metaphysics understood its role when it has simply trodden in the steps of physics, in the chimerical hope of going further in the same direction? Should not its own task be, on the contrary, to remount the incline that physics descends, to bring back matter to its origins, and to build up progressively a *cosmology*, which would be, so to speak, a *reversed psychology*?[22]

> Everything is obscure in the idea of creation, if we think of *things* which are created and of a *thing* which creates, as we habitually, as the understanding cannot help doing.... It is natural to our intellect, whose function is essentially practical, made to present to us things and states rather than changes and acts. But *things-and-states are only views, taken by our mind, of becoming. There are no things, there are only actions.*[23]

Epoché, refraining from judgments based on such "views" (Greek *doxa*, Sanskrit *drishti*, Pāli *diṭṭhi*), the philosophical method brought from India by Pyrrho of Elis at the time of Alexander the Great, has become in the 20th century the fundamental method of Husserl's "meditating philosopher" in phenomenological analysis. It is a "science of phenomena, which lies far removed from our ordinary thinking, and has not until our own day therefore shown an impulse to develop ... so extraordinarily difficult ... a new way of looking at things, one that contrasts at every point with the natural attitude of experience and thought, whose development is felt, however, as an 'urgent need nowadays.'"[24]

The teaching of the Buddha was, with a still wider purpose, the expression of "the right effort" (*sammā-vāyāmo*) to "swim against the stream" of such world-views, i.e. "...the type of views called the thicket of views, the wilderness of the contortion of views, the vacillation of views, the fetter of views...."[25]

In Bergson's theory of intuition, the act of "swimming against the stream" is interpreted with his basic French term *Torsion*:

> Let us try to see, no longer with the eyes of the intellect alone, which grasps only the already made and which looks from the outside, but with the spirit, I mean with that faculty of seeing which is immanent in the faculty of acting and which springs up, somehow, by the *twisting of the will on itself*, when action is turned into knowledge, like heat, so to say, into light.[26]

> By intuition I mean instinct that has become disinterested, self-conscious, capable of reflecting upon its object and of enlarging it indefinitely. That an effort of this kind is not impossible is proved by the exis-

tence in man of an *aesthetic faculty* along with the normal perception.... This intention is just what the artist tries to regain, in placing himself back within the object by a kind of *sympathy*, in breaking down, by an effort of intuition, the barrier that space puts up between him and his model.[27]

The ultimate metaphysical consequences implied in a theory of causation based on the biological phenomenon of the "ripening fruit" were taken into adequate consideration only in some later philosophies of existence. Yet the preparatory vitalistic stage of modern philosophy remains more important for an Indian reinterpretation of the theory of *karma* than can be assessed within strictly European limits, where the importance of the missing link between the vitalist and existentialist stages—the link of a new theory of causality—has not yet been fully and explicitly realized. Let us therefore conclude the survey of this cycle of ideas by returning to the lowest level on which Bergson's vitalistic interpretation of cosmic matter had to establish a new starting point:

> Let us merely recall that extension admits of degrees, that all sensation is extensive in a certain measure, and that the idea of unextended sensations, artificially localized in space, is a mere view of the mind, suggested by an unconscious metaphysic much more than by psychological observation. No doubt we make only the first steps in the direction of the extended, even when we let ourselves go as much as we can. But suppose for a moment that matter consists in this very movement pushed further, and that *physics is simply psychics inverted*.[28]

The conception of "a cosmology which would be a reversed psychology," or of physics understood "simply as psychics inverted," was destined to become the fulcrum for a transition from a physical to an historical orientation in other contemporary philosophies. This transition is also clearly marked in Whitehead's later works: "Physical endurance is the process of continuously inheriting a certain identity of character transmitted through a historic route of events."[29]

Bergson expressed this emphasis in terms which brought him still closer to a specific aspect of later existentialist thought: the predominant importance of the future for (karmic) shaping of the present by the past. Though Heidegger's critique of Bergson's idea of the "stream of experience" was concentrated on this point, where in an initial metaphor Bergson compares a "mental state, as it advances on the road of time, continually swelling with the duration which it accumulates" with "a snowball on the snow, rolling upon itself" and thus increasing—we can read a few pages later in the opening chapter of *Creative Evolution* another statement, anticipating Heidegger's objection to some extent: "Duration is the continuous progress of *the past which gnaws into the future* and which swells as it advances."[30]

III

Martin Heidegger, in his basic work, *Being and Time*,[31] seems to take over the meditation on "the ripening fruit" at the critical point reached by Bergson's analysis of its wider biological scope: the karmic predicament of human existence. It can be seen from Heidegger's numerous critical references to Bergson (though in many cases I would not agree with them) that in the meantime it had become obvious that there was more to elicit by the process-philosophy than the biologically oriented thinkers of the vitalist period could realize. The philosophy of existence undertook this work in essentially different dimensions. Heidegger in particular was very careful and explicit in critically adapting new methods of independent historical thinking in the philosophy of culture introduced by Dilthey, and above all the new structure of transcendental logic laid down by his teacher Husserl, for phenomenological analysis independent of natural science. Within the scope of this new framework, similarities with Buddhist thought emerge still more strikingly, especially in the domain of the "suffering/concern" theme and the need for the notion of *karma* in a process-multiple causality structure.

The second part of Heidegger's *Being and Time* deals in particular with problems of human reality and temporality (*Dasein und Zeitlichkeit*). The possibility for human being to attain to full ripeness in an existence conditioned by man's "being-towards-death," is discussed in the first chapter ("Dasein's authentic potentiality-for-being-a-whole and its being-towards-death"). Chapter Five is dedicated to "temporality and historicality" as essential constituents of the human being[32] involved in this ambiguous process.

> When, for instance, a fruit is unripe, it "goes toward" its ripeness. In this process of ripening, that which the fruit is not yet is by no means pieced on as something not yet present-at-hand. The fruit brings itself to ripeness, and such a bringing of itself is a characteristic of its being as a fruit. Nothing imaginable which one might contribute to it would eliminate the unripeness of the fruit, if this entity did not come to ripeness *of its own accord*. When we speak of the "not-yet" of the unripeness, we do not have in view something else which stands outside, and which—with utter indifference to the fruit—might be present-at-hand in it and with it. What we have in view is the fruit itself in its specific kind of being.... The ripening fruit, however, not only is not indifferent to its

unripeness as something other than itself, but it is that unripeness as it ripens. *The "not-yet" has already been included in the very being of the fruit*, not as some random characteristic, but as something constitutive. Correspondingly, as long as any Dasein is, it too *is already* its "not-yet."[33]

The implicit emphasis laid on the difference from the "classical" European mechanist theory of causality is obvious enough.

The karmic process, in its Buddhist meaning, can be defined as a vicious circle of "interdependent origination" (*paṭicca-samuppādo*), consisting of a chain of twelve rings (*nidānam*), the first of which is *avijjā*, "ignorance," or better, metaphysical nescience of a human being (defined by Heidegger as a "being-there"—*Dasein*) about his own emergence in the flux of existence. The last ring of the chain is "death." Heidegger's analysis of human reality as a "being there" in the world is not less distinctly determined and delimited by the tension of the same polarity—ignorance and death:

> If the term "understanding" is taken in a way which is primordially existential, it means to be *projecting towards a potentiality-for-being for the sake of which any Dasein exists*. In understanding, one's own potentiality-for-being is disclosed in such a way that one's Dasein always knows understandingly what it is capable of. It "knows" this, however, not by having discovered some fact, but by maintaining itself in an *existentiell* [Essential] possibility. The kind of *ignorance* which corresponds to this, does not consist in an absence or cessation of understanding, but must be regarded as a deficient mode of the projectedness of one's potentiality-for-being. Existence can be questionable.... When one understands oneself projectively in an *existentiell* possibility, *the future underlies this understanding*, and it does so as a coming-towards-oneself out of that current possibility as which one's Dasein exists.... Projection is basically futural.... Temporality does not temporalize itself constantly out of the authentic future. This inconstancy, however, does not mean that temporality sometimes lacks a future, but rather that the temporalizing of the future takes various forms.[34]

This seems to explain one step further the "hesitation" of the self "until a free action is detached as an overripe fruit," as Bergson expressed the limits of freedom as release (*moksa*) within the scope of a karmic determinism.

> With ripeness, the fruit *fulfills* itself. But is the death at which Dasein arrives, a fulfilment in this sense? With its death, Dasein has indeed "fulfilled its course." But in doing so, has it necessarily exhausted its specific possibilities?... For the most part, Dasein ends in unfulfilment, or else by having disintegrated and been used up. Ending does not necessarily mean fulfilling oneself. It thus becomes more urgent to ask *in what sense, if any, death must be conceived as the ending of Dasein*.[35]

Arising out of this situation, the problem of *karma*, implicitly felt as an "anticipatory resoluteness" in "concrete working out of temporality" aiming at "an authentic historizing of Dasein," is further discussed as the existential problem of "Dasein's potentiality-for-being-a-whole."[36]

Since "those possibilities of existence which have been factically disclosed are not to be gathered from death... we must ask whence, in general, Dasein can draw those possibilities upon which it factically projects itself." The answer is:

> The resoluteness in which Dasein comes back to itself, discloses current factical possibilities of authentic existing, and discloses them *in terms of the heritage* which that resoluteness, *as thrown, takes over*. In one's coming back resolutely to one's thrownness, there is hidden a *handing down to oneself* of the possibilities that have come down to one, but not necessarily as having *thus come down*,[37]

We shall take for granted that the coincidence of the expression (underlined by me) "thus come down" with the literal meaning of the most common attribute of the Buddha—*tathāgata*—is another of many casual cases where a modern philosophy of essentially the same trend as our archaic one will, to some extent, come to use the same terms in expressing ideas of the same kind. What is meant here by the same trend will be explicated later. Let us first single out the specific meaning of this important term in the specific context.

The word *tathāgata*, in its widest sense in the early Pāli literature, is used as a designation of "human being" in general. Its logical connection with Buddha's best known definition of the human being as "heir of his own actions" is obvious, even when it is used as the highest epithet of the Buddha.

What Heidegger wishes to point out is that the "heritage" of a *tathāgata* has not to be understood here as a passive facticity of historically "objectified" social tradition or collective behavior, which in Heidegger's terms would be designated as "inauthentic heritage." Unlike the social study of external history, Dasein in its intimate ripening "never comes back behind its thrownness" in the "situationality" of its world. In other words, in a personal history there is no possibility of statically objective repetition of one and the same situation. This is the basic law of karmic development that both Bergson and Heidegger try to confirm on different levels of their investigations.

On this point, in Heidegger's philosophy, "thrownness" appears as a critical term whose meaning has to be better determined, in view of the fact that it denotes an obvious Christian "cypher" for a karmically determined situation. This historical implication in basic existentialist terminology could even be interpreted by some critics as revealing an apparent deficiency of our analogy, had not Heidegger, fortunately for us, explained it, in the same context, by an "attribute" synonymous with the basic First Truth of the Buddha, *dukkham*, "anguish" or "worry": "Before we decide too quickly whether Dasein draws its authentic possibilities of existence from thrownness or not, we must assure ourselves that we have a full conception of *thrownness as a basic attribute of care.*"

The translation of the German word *Sorge* by "care" may often diminish the full meaning of "Dasein's character" of this fundamental "*existentiale*" or practical category on which Heidegger's entire ontology is built. From our standpoint, "worry" would often seem a preferable translation. Yet Heidegger himself has left no doubt about the meaning of this term. At the end of the first part of *Being and Time*, whose aim it was to "exhibit Care (*Sorge*) as the Being of Dasein," i.e. "of that entity which in each case we ourselves are, and which we call 'man,'" the basic "ontical" meaning of *Sorge* is interpreted (and illustrated by an ancient fable) as "worry" and "grief."[38]

The continuation of the inquiry shows how the karmic phenomenon has to be comprised within the scope of this central theme—how the essence of worry and grief is revealed in response to the "call of conscience." First of all Heidegger's philosophy is no longer a philosophy of *consciousness*, but a philosophy of *conscience*. (The word "consciousness" is never used by Heidegger except in critical disputes, mainly with the Kantians.) Here conscience discloses itself as the awakening call which alone can liberate us from our lost condition (*Verlorenheit*) and thrownness in *avijjā* (*avidya*, ignorance), or metaphysical "nescience." Only in giving heed to the awakening call does "Dasein understand itself with regard to its potentiality-for-being" in man's mindfulness and resoluteness "to take over in his thrownness—right under the eyes of Death—that entity which Dasein is itself, and to take it over wholly," as his karmic load. In Heidegger's words, "Resoluteness is defined as a projecting of oneself upon one's own being-guilty—a projecting which is reticent and ready for anxiety."[39] This is the ultimate moral aspect of the "hesitation in the ripening fruit" of the Bergsonian "creative activity."

The last metaphysical (or better, eschatological) question to which Heidegger's inquiry into the phenomenon of *karma*, or "ripening fruit," arrives, concerns the origin of that strange experience, the primeval phenomenon of all religion: being-guilty.

> [The call of conscience] is the call of care. Being-guilty constitutes the being to which we give the name of "care." In uncanniness Dasein stands together with itself primordially. Uncanniness brings this entity face to face with its *undisguised nullity*, which belongs to the possibility of its ownmost potentiality-for-being.[40]... *The appeal calls back by calling forth:* it calls Dasein *forth* to the possibility of taking over, in existing, even that thrown entity which it is.[41]

The statement underlined by me ("*Der Anruf ist vorrufender Rückruf*") is the best shortcut definition of *karma* that I can imagine, even if it had to be formulated by the greatest master of Zen art in Japan (an art not at all unknown to Heidegger). The next one is not less pregnant with deep oriental meaning:

> We have seen that care is the basic state of Dasein. The ontological signification of the expression "care" has been expressed in *the definition: ahead-of-itself-being-already-in* [*the world*] as being-alongside entities which we encounter [within-the-world].[42]

Heidegger insists on an implicit consciousness of *karma*[43] in the experience of care, or worry, as Dasein's "understanding of itself in being-guilty."[44] He equally insists on the fact that even "phenomena with which the vulgar interpretation has any familiarity point back to the primordial meaning of the call of conscience when they are understood in a way that is ontologically appropriate" and that "this interpretation, in spite of all its obviousness, is *by no means accidental.*"[45]

And yet, the call of conscience is "a keeping silent.... Only in keeping silent does the conscience call; that is to say, the call comes from the soundlessness of uncanniness, and the Dasein which it summons is called back into the stillness of itself, and called back as something that is to become still."[46] A Japanese student in Heidegger's seminar once interpreted this course of thoughts in terms of a few Zen *kôans*.[47] A follower of Ramana Maharshi in India could do it just as well to Heidegger's full satisfaction.

Having, unfortunately, no better word than "destiny" wherewith to designate the full range of *karma* (though fully conscious of the wide horizon it encompasses), Heidegger brings us ultimately to the following summary of essential questions on this subject:

> But it remains all the more enigmatic in what way this event as destiny is to constitute the whole "connectedness" of Dasein from its birth to its death. How can recourse to resoluteness bring us an enlightenment? Is not each resolution just *one* more single "experience" in the sequence of the whole connectedness of our experience?... Why is it that the question of *how the "connectedness of life"* is constituted finds

no adequate and satisfactory answer? Is our investigation overhasty? Does it not, in the end, hang too much on the answer, without first having tested the legitimacy of the *question*?[48]

Speaking of the problem of re-emergence or "recurrence" of existential situations in their essential dependence on "destiny" in Dasein's "historizing" course, Heidegger does not even indirectly attempt to formulate any hypothesis analogous to "rebirth" (as, e.g. Nietzsche did in his own way) in Indian religious thought (*punarbhava*), though his sensitivity for the "enigmatic" remainder of the problem, as traced above, permits a closer approach to this complex issue: "Dasein can be reached by the blows of destiny only because *in the depth of its own being Dasein is destiny*. . . . a possibility which it has inherited and yet has chosen."[49]

In suggesting the categorical designation of *karma* for the *whole range of problems concerning the organic connectedness of vital processes whose ripening results in creative activity*, my intention remains far from any attempt to propose any overhasty solution or pattern that could be discovered ready-made in the transcendental schematism of some specific type of Asian philosophy or religion, such as Buddhism. Though, for the purpose of the present survey, Buddhism was chosen as the *tertium comparationis*, it was presumed as a well-known fact that the historical origin of the categorical designation of *karma* in Indian philosophy is considerably older than its specific interpretation by the Buddha.

Notes

[1] Friedrich Nietzsche, *The Anti-Christ*, §20 (Penguin Classics), pp. 129–130, and *Ecce Homo*, § 6 (my translation).

[2] *Samyutta-nikayo*, XXII, 86 and 85. Quotations from Pāli texts are adapted mainly from the Pāli Text Society (London) editions of the Translation Series.

[3] Quotations from *Classic American Philosophers*, (New York, Appleton-Century-Crofts, 1951), pp. 160, 155, 161, 163n.

[4] Some analogies between Whitehead and Buddha have recently been discussed by Kenneth K. Inada, "Whitehead's 'Actual Entity' and the Buddha's Anātman," in *Philosophy East and West*, July 1971. Prof. Inada mentions at the beginning that Whitehead "especially in his later works makes several references to the Buddha," though his knowledge of Buddhism was rather superficial and on certain points basically wrong. Independently of such occasional direct references, Whitehead's philosophy in its original structure "shows strains of thought remarkably similar to those of the Buddha." Some of Inada's implicit references could be of much use also for a wider comparison with Bergson from the same Asian standpoint. The article does not deal with the subject of *karma*.

[5] "The Perception of Change," in *The Creative Mind* (N.Y., Philosophical Library, 1946), p. 173.

[6] Cf. *The Creative Mind*, p. 250.

[7] *Ibid.*, p. 222.

[8] H. Bergson, *Creative Evolution*, translated by A. Mitchell (N.Y., Modern Library, 1944), pp. 3, 10. (Quoted in the continuation as *C. E.*)

[9] *Ibid.*, p. 9.

[10] *Essai sur les Donnees Immediates de la Conscience*, 68th ed., (Presses Universitaires de France), p. 132.

[11] *Anguttara-nikayo*, III, 76, 33, IV, 77. Cf. translation by Nyanaponika Thera (Kandy, The Wheel Publication No. 155–158), pp. 51, 23, 92.

[12] *C. E.*, p. 8. Sartre has reformulated this problem on a deeper existential level, in his *Being and Nothingness*, translated by H. R. Barnes (N.Y., The Citadel Press, 1966), p. 114f.: "There is no absolute beginning which without ever having past would become past. Since the For-itself, qua For-itself, has to be its past, it comes into the world *with* a past. These few remarks may permit us to view in a somewhat different light the problem of birth. . . . There is a metaphysical problem concerning birth in that I can be anxious to know how I happen to have been born from that *particular* embryo. . . . " Bergson's emphasis is also always on the concreteness and uniqueness of each creative act, even on the lowest biological level.

[13] *Ibid.*, pp. 113, 57.

[14] *Ibid.*, pp. 59, 33.

[15] *Anguttara-nikāyo*, III, 99. Sartre's analysis of "human reality" as "a project of being" brings him to the conclusion: "We can ascertain more exactly what is the being of the self: it is *value*." (*Being and Nothingness*, p. 92)

[16] Cf. *C. E.*, pp. 27–35.

[17] *Ibid.*, p. 34f. Italicizing in this and following quotations are partly mine.

[18] *Ibid.*, p. 364.

[19] *Ibid.*, p. 370.

[20] Compare the discussion of "The Problem of Time" from this standpoint in Chapter V of Nyanaponika Thera's *Abhidhamma Studies* (Kandy, Buddhist Publication Society, 1965) pp. 104ff., portions of which appeared in "Time and Consciousness," *Main Currents*, 23, 4 (March–April 1972), pp. 131–135.

[21] *C. E.*, p. 380.

[22] *Ibid.*, p. 227f.

[23] *Ibid.*, p. 270.

[24] E. Husserl, *Ideas: General Introduction to Pure Phenomenology*, translated by W. R. Boyce Gibson (N.Y., Macmillan, 1931).

[25] *Majjhima-nikāyo*, 2, *Sabbāsava-suttam*.

[26] *C. E.*, p. 273.

[27] *Ibid.*, p. 194.

[28] *Ibid.*, p. 221.

[29] *Science and the Modern World*, p. 156.

[30] *C. E.*, pp. 4, 7.

[31] Martin Heidegger, *Being and Time*, translated by J. Macquarrie and E. Robinson (N.Y., Harper and Row, 1962). Quoted in the following notes as *B.T.*

[32] Heidegger's designation of human being as *Dasein* ("being here" or "being there," i.e. in the world, which is always "one's own") has been interpreted by Sartre, in *Being and Nothingness*, as "human reality," a term which will be occasionally used in the continuation.

[33] *B.T.*, p. 243. (Marginal German page numbers used here and following.)

[34] *Ibid.*, p. 336.

[35] *Ibid.*, p. 244.

[36] *Ibid.*, p. 309.

[37] *Ibid.*, p. 383.

[38] Cf. *Ibid.*, pp. 196–200.

[39] *Ibid.*, p. 382.

[40] Cf. Nāgārjuna's statement in *Mādhyamaka-kārikā*, 24, 14: "For him who admits nullity all appears to be possible. For him who does not admit nullity nothing appears to be possible."

[41] *B.T.*, p. 286f.

[42] *Ibid.*, p. 249.

[43] As we shall see in the continuation, for lack of a better word in European tradition, Heidegger uses the word "destiny" (*Schicksal*) in the meaning which comes closest to *karma*. Schopenhauer, who was aware of the specific meaning of this category in Indian philosophy (in Vedānta and Buddhism) could not find a better term in European languages, and made efforts to adjust the meaning of "destiny" to the basic Indian idea of *karma*. An analogous effort is often made by Heidegger.

[44] *B.T.*, p. 292

[45] *Ibid.*, p. 294.

[46] *Ibid.*, p. 296.

[47] Tsujimura Koichi (University of Kyoto), in 1957. I have published the translation of his seminar paper on "The Nothing in Zen" in my Yugoslav book on Oriental Philosophy (cf. Č. Veljačić, *Filozofija Istočnih Naroda*, Vol. II, Zagreb, 1958).

[48] *B.T.*, p. 387.

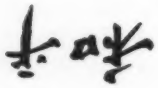
[49] *Ibid.*, p. 384.

Bhikku Nanajivako (Čedomil Veljačić) was born in Zagreb, where he took his Ph.D. in Indian and Greek philosophy at the University of Zagreb, and where later he returned as a lecturer in Asian philosophy. After two years as a visiting professor in India, he went to Ceylon and was ordained a Buddhist monk. He lives presently at the Cetiyagari Hermitage, Pallepola, Ceylon. Besides translations from the Sanskrit and Pali, his principal work in Europe was a History of Oriental Philosophy, *published in Zagreb in 1958. He has contributed a number of essays to* Indian Philosophical Annuals, *University of Madras, and is presently preparing* A Buddhist Philosophy of Religion *for the Buddhist Publication Society, Kandy, Ceylon. A previous article relating Buddhism to contemporary Western philosophy, "Anicam—the Buddhist Theory of Impermanence," was published in* Main Currents, *27, 5 (May–June 1971).*

Self-Realization and The Inner Process of Peace

CHUNG-YUAN CHANG

THE ACHIEVEMENT OF HARMONIOUS RELATIONSHIP BETWEEN REALITY AND APPEARANCE IN ART AND LIFE

THE WORD PEACE IN CHINESE IS HO P'ING: 

Ho p'ing, more precisely, means harmony and tranquility. In a relative sense it is the opposite of discord. Harmony and discord through their polar relationship successfully and ceaselessly interact to create the history of mankind and the advancement of the world. The highest sense of peace is what we might call, in the words of Whitehead, "a deep underlying harmony," which is inherent in both man and the universe. It is the "ground" of all harmonies, from which emanates the all-expanding energy that constantly creates a new universe. Without it nothing that is real can be achieved. It is invisible and unfathomable beyond the realm of discursive thinking. It can only be experienced as a profound inward feeling, an immediate reflection of deep metaphysical insight, which is unverbalized and yet momentous in its action. We cannot define and point to it, but through poetic and figurative expression, our inner being may echo the tone of the inner realm of those who achieve this sense of peace. Let us listen to the inner voice of Li P'o (701-762), the great poet of the T'ang Dynasty:

"You ask me why should I stay in this blue mountain.
I smile but do not answer. O, my mind is at ease!
Peach blossoms and flowing streams pass away without trace.
How different from the mundane world!"

The sense of delight of the poet cannot be expressed in words. It is the deep underlying harmony of the nature of all things, in which there is no record of blossoming or fading peach flowers, and no lament upon the symbolic meaning of the never-returning stream, such as Confucius once made while standing at the bank of a river: "It passes on like this, never ceasing, day or night!" The immediate reflection of the highest sense of peace is identified neither as discursive understanding nor as sentimental emotion, but rather as an instantaneous insight into truth, which makes us feel infinitely blessed while experiencing it. It is our absolute mind which identifies all differentiations, and is unconditioned by any dichotomies or opposites. The poem of Li P'o, however, could not serve as a *kung an* or *koan* in Japanese according to Zen doctrine because, on the one hand, the poet smiles and gives us no answer; on the other hand, he tells us how delightfully his mind is at ease, that the world in which he lives is delightfully different from the mundane world. His mind still holds something enchanting and yet is not entirely free from it. The following poem of Wang Wei (699-759) will serve as an example of how indescribable is the absolute mind.

"Of late I deeply devote myself to quiescence.
Nothing in the world concerns my mind.
The breeze from the pine woods blows my sash;
The mountain moon shines upon my harp.
You ask me to explain the reason of failure or success,
The fisherman's song goes deep into the river."

To involve one's self in the disputatious dichotomies of failure and success, one would be trapped in endless complexity. Instead, when our poet gives his answer he only mentions something else, irrelevant to the question which is put to him. Although he did not say that his mind is at ease, and that the world in which he dwells is different from the mundane world, we can feel the unfolding inner realm of our poet in which nothing is contained. His mind might be compared to a pail of which the bottom is broken through. This answer without an answer is the most effective description of the deep underlying harmony of our poet, Wang Wei, and the poem is just its reflection, the product of the absolute mind.

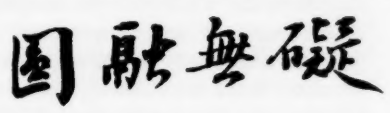
Turning from poetry to another art, perhaps we can illustrate the reality of the deep underlying harmony found in Chinese painting. Here we have a concrete and direct

comprehension of the power of the highest sense of peace. When an artist introduces certain fineness of form or color into the welter of incoherent fragments entering into our experience with an existential unity, this process of refinement gives us an apprehension of perceptual values and feelings. However, our aesthetic pleasure is derived from a mere spatio-temporal pattern of sense. The harmony achieved from "the pattern sense" is a "qualitative harmony," the harmony of the lower senses conditioned by objective situations. But this is a relative harmony and is constantly subject to change and disorder outside its pattern or form as imposed by the artist. On the other hand, in Zennist or Taoist painting, a straight line of bamboo or the gnarled lines of a pine tree become no merely visual impression and no merely physical sensation to be communicated. When we stand before the paintings of Liang Chiai or Ma Yuan of the twelfth century, our intuition does not draw us outward to analysis of conceptual components, but turns our mind inward to feel something in us unfolding the mystery of our own hearts. The mystery in this opening secret of our hearts is not due to the particular beauty of the picture, but to its wholeness, its freedom of motion and freedom of expression, overflowing and removing the mutually excluding opposition between the painting and ourselves. Thus we throw our whole being into the beauty and move along with it. To exemplify this feeling we have Laurence Binyon's personal experience to speak to us:

"I recall a little painting of uncertain date but inspired by a poem of Wang Wei's, eighth century poet-painter; the subject is just a sparse wood of stunted trees on a flat foreland; misty water and still sky. Nothing of what to the average mind is beautiful; yet in this foreland scene there was something strangely moving, just because the painter had absorbed the solitude of trees and water into himself. He had painted it internally, so to speak, not as something alien and seen from the outside." Binyon says further: "With Chinese, space often becomes the protagonist in the design. It is not final peace, but itself an activity flowing out from the picture into our minds, and drawing us into a rarer atmosphere. It is tranquilizing, but even more so, it is exhilarating."[1]

What is this atmosphere which moves from objects painted to the painter himself? And thence from the painting to the observer? This is the movement of the deep underlying harmony which interfuses and interpenetrates between man and man, between man and things. It emerges from immediate reflection of absolute reality of ourselves. There is a Zennist saying, "Willows are green and flowers are red." But at the same time it is said: "Flowers are red yet not red; willows are green and yet not green." The first affirmation is to indicate the facts of our experience accepted as "suchness." It is the immediate reflection. The second statement involves both affirmation and negation, but they are not contradictory to one another. It helps us, rather, to enter the realm of absolute reality. Because in the realm of absolute reality there is no need for the process of rational analysis or discursive thinking. What is affirmation is negation and what is negation is affirmation. This is true even on so elementary a level as the flowers and the willows. Both are red and not red, both are green and not green. It is by such simple steps that we enter into and unlock the nature of boundless infinitude, thus losing our egoselves. It is in this direction that lies the cultivation of spiritual intuition and the achievement of absolute freedom.

What the painter produced is the absolute reality of objects as he felt them through his absolutely free play of intuition. Through the medium of the painter's strokes with his "inner brush" this becomes something that moves with absolute directness and force into the mind of the observer. Binyon says: "What he (the painter) put into his work comes out from it and flows over into our minds; and we recognize something which cannot be called intellectual only, sensuous only, or emotional only; it is wholeness of spirit which goes out, free and unafraid, into wholeness of universe."[2] This wholeness of universe is what he means when he refers to a "rarer atmosphere." It is what Whitehead refers to as the underlying harmony. And the movement from object painted to painter, from the painting to the observer, is, to turn to Buddhist phraseology, *Yuan yung wu ai*, or "perfect mutual unimpeded solution" of things, a manifestation of Nature's mysterious capacity of interfusion and interpenetration.



In the history of Chinese painting we have numerous illustrations that reveal this sense of spiritual intuition, a "wholeness of spirit" which moves freely and fearlessly into a "wholeness of universe" in a way that Laurence Binyon has described for us. Perhaps one more illustration will help us. It is, perhaps, the most radical story of its kind.

During the seventh century Wu Tzo-tzu (d.792) completed his last masterpiece for the royal court. It was a landscape painted on a wall of the court. Wu Tzo-tzu drew aside the coverings and the Emperor gazed at the vast and awesome scene and its magnificent detail: woods, mountains, limitless expanses of sky speckled with clouds and birds, and even men in the hills. "Look," said the artist pointing, "here dwells a spirit in a mountain cave." He clapped his hands and the gate of the cave immediately flew open. The artist stepped in, turned, and said, "The inside is even more beautiful. It is beyond words! Let me lead the way!" But before the Emperor could follow or even bring himself to speak, the gate, the artist, the painting and all faded away. Before him remained only the blank wall with no trace of any brush marks.

This charming story is intended to reveal directly to us that within the outward appearances of all beauty there

lies the "rarer atmosphere" or the unity of background, as Binyon calls it elsewhere, which serves as the ultimate reality of all appearances. It is through this ultimate reality that our minds are opened to see our own "wholeness of spirit," and enter into the wholeness of the universe, the deep underlying harmony of all things.

According to the Taoists, our daily life gains its significance by being rooted in a "deep underlying harmony," or ultimate reality. So long as we deviate from the world of reality, we can never reach true peace. What we may, and often do achieve is a kind of pseudo-harmony, which we often confuse with reality. It is only when the absolute reality impresses itself upon our daily life in a lively manner—that is, through our activities—that our daily life gains its real value. Only in this way will be able to order our lives with an inward harmony and a higher sense of peace. In the second chapter of Chuang-tzu, we have a metaphor illustrating the inner harmony between absolute reality and outward activities:

> "Once the Penumbra asked the Umbra: 'Previously you were walking and now you have stopped; previously you were sitting and now you have stood up. Why is it that you lack stability of intention?' The Umbra replied: 'It is because what I do is in accordance with the movements of something else. . . . My accordance with the movements of something else is like the accordance of the snake with its scales and the accordance of the cicada with its wings. How can I know why I do one thing and not the other?'"

The actions of the Umbra, in movement or at rest, sitting down or standing up, are the various appearances of something else which is the *ultimate reality*. Appearance must belong to a reality—indeed it is an *expression* of reality. Appearance must, we see then, be one with reality.

This is exactly what Lao Tzu said in the first chapter of the *Tao Te Ching:*

> "Oftimes without intention I see the wonder of Tao.
> Oftentimes with intention I see its manifestations.
> Both of these are the same in origin;
> They are distinguished by names after their emergence.
> Their identification is called mystery.
> From mystery to further mystery there is an entrance to all wonders."

To explain this mystery of the identification of appearance and reality, we may find it helpful to turn to some of the basic concepts of the Hua Yen School of Chinese Buddhism which was developed during the seventh century.

First, let us look at the two basic ideas, ***Shih*** and ***Li.***

Li—Reality 理

Shih—Event 事

Shih means event, or form. In the ordinary sense it is an event which refers to a happening. But in the ***Book of Changes*** we read, "That which is solved by changes is ***Shih.***" (Hsi T'su) This definition of ***Shih*** is similar to the concept of event as expounded by Whitehead. "A molecule," Whitehead says, "is an historical route of actual occasions, and such a route is an event."[3] This is to say that an event is really its actuality in the process of motion. Event is more than its static condition. The ever-changing event is what is called ***Shih.*** It is particularity in action.

Li, in its ordinary sense, is reason or principle, but by the Hua Yen School it is often used as the Absolute or Reality, and eventually it means Void or Non-Being. It always stands contrasted to ***Shih*** and, therefore, is universality in action, all-embracing and all pervading. Hsuang Shih-li, a well-known Chinese philosopher, in his ***Treatise on New Mere Ideation,*** expounds ***Li*** as the essence of Reality, which consists of both Void and Silence. Void does not mean nothingness in the sense that something once was and now is not. It is the ontological foundation from which event or form manifests itself. Therefore, ***Li*** and ***Shih*** are not separate existences, but together they comprise the one. Daisetz T. Suzuki clarifies this idea, saying that ***Li*** is not separate and independent in existence. It does not mean extinction—it always exists in conjunction with the individual event or form and co-exists with it. To those who live merely in the world of sense, ***Shih*** is no more than the existence of individual objects. To the Hua Yen School, on the other hand, these individual objects are placed in the ***Li*** world in such a way that ***Li*** is ***Shih*** and ***Shih*** is ***Li,*** in a state of "perfect mutual unimpeded solution." The theory that ***Li*** and ***Shih*** or Reality and Appearance are essentially one is clearly phrased by Francis Herbert Bradley:

> "The Reality is nothing at all apart from appearance. . . . Reality appears in its appearances, and they are its revelation: and otherwise they also could be nothing whatever. . . . And Reality is one Experience, self-pervading and superior to mere relations. Its character is the opposite of that fabled extreme which is barely mechanical, and it is, in the end, the sole perfect realization of spirit."[4]

Thus two elements, ***Li*** and ***Shih,*** or Reality and Appearance, though they are both necessary aspects of the one Being, according to the habits of the intellection they cannot, in truth, be separated entities. Nor can they be scrutinized or removed from one another without obscuring their essential nature. To illustrate the absolute oneness between ***Shih*** and ***Li*** we may refer to the parable of the Golden Lion.

In the seventh century when Fa Tsang, the founder of the Hua Yen School, was lecturing at the royal court, he was faced with the difficulty of expounding the theory of the "unimpeded mutual solution" of ***Shih*** and ***Li,*** or the identification of Appearance and Reality. Fa Tsang

pointed to a golden lion in the court and delivered his famous parable. Gold symbolizes Reality, and the lion, he said, symbolizes Appearance. Reality is formless by itself but assumes any form which circumstances give it. Similarly, gold has no "nature of its own" but is shaped into the form of a lion as its appearance.

The existence of the lion is wholly dependent upon the existence of gold. Without the gold there would be no lion. That is to say, without Reality there can be no existence of Appearance. On the other hand, without the form of the lion there is no expression of gold. Appearance reveals the existence of Reality. The gold and the lion harmoniously co-exist; they are merged together, but this by no means impedes either from being itself. When one sees the lion, the gold is neglected. When one sees the gold, the lion is obscured from sight. When the mutual conditioning of gold and lion is in perfect harmony, the dichotomy of *Li* and *Shih* is gone. Reality is Appearance, Appearance is Reality. No words can express this identification—our mind is simply and abruptly enlightened. This is what Chuang means when he speaks of "Heavenly identity." "Heavenly identity" is what Lao Tzu calls the "mystery," the same origin of Reality and Appearance—what Whitehead calls the deep underlying harmony.

It is this idea of "mystery" that Chinese painters and poets use to such rich advantage in their work. The "sparse woods, still sky and misty water" which, Binyon says, so perfectly identify the "rarer atmosphere" of the painting, has its parallel in the story of the Golden Lion. The atmosphere reality of the painting penetrates perfectly into the form of tree, of sky and of water, just as the gold is completely identified and nothing hinders their mutual unimpeded solution. It is through this wholeness of spirit that we are led to see the harmony of harmonies, the origin of all beauties.

We have been trying to see what the Taoist means when he speaks of the "underlying harmony" of Reality. This task is necessarily a difficult one, especially when we begin with the realization that it is impossible to put into words, and that it can best be approached by indirect suggestion. In order to understand this better, we might turn briefly to Bradley's speculations on the nature of Reality, even though his approach is a rational and analytic one.

Bradley, after a great deal of hair-splitting on the nature of truth and thought, realizes, even as the Taoists do, the limitations of thought in coming to grips with Reality. In *Appearance and Reality,* he clearly maintains: "Reality is above thought and above every partial aspect of being, but includes them all. Each of these completes itself by uniting with the rest, and so make the perfection of the whole. And this whole is experience, for anything other than experience is meaningless."[5] Bradley attempts to reach Reality by intellectual analysis, but he discovers the limitation of attainment inherent in discursive and rational thought. It is rather by "experience" or, as he says elsewhere, a "higher immediacy" by which we grasp the nature of Reality. This wholeness of experience must be immediate, like feeling, but, not like feeling, immediately at the level below distinction and relation. In the process of approaching Reality we inevitably reach a stage which is beyond thought, where mere intellection becomes helpless, and we can only intuitively experience it. Therefore, at the conclusion of his work, *Appearance and Reality,* he announces openly that Reality is spiritual. What is this realization of spirituality of which Bradley speaks? Is it not the process of the awakening of new consciousness? In Chinese philosophy, the new consciousness is not conceived of as new at all. It is the self-consciousness to be realized to the fullest depths; that is, consciousness itself turning inwardly into itself. In Zen's expression, it is the seeing of one's own "original face" before one is born. Therefore, the realization of spirituality is simply the consciousness coming to its own unconsciousness. In the Taoist expression the former is *T'ai Chi* or ultimate, the latter *Wu Chi* or the Ultimateless. The perfect realization of spirituality as one Experience is expressed by Lao Tzu as a "Return to the Ultimateless."

In this connection I must point out that we are neither to identify Bradley's system of Reality and Thought with the system of Chinese Taoism, nor are we to neglect the self-contradictions in his discussion of Reality, as pointed out by his critics. But beyond the limitation of intellectual analysis, Bradley proceeds from thought to thoughtless, "beyond thought," and from intellection to high immediacy or "one Experience."

It requires a great mental effort on our part to view all things, in their dissimilarities and relations, as one thought. This thought clearly contains no boundary of differentiations and distinctions. It is spiritual, "a sole perfect realization of spirit." When the mind reverses its usual course and, instead of dividing itself externally, goes back once more to its inner unity, it has begun to move to a state that we may call "one-thought-viewing." In fact, our logical as well as practical consciousness is overdevoted by far to thought and analysis. We tend to direct reality into bits and pieces in order to better understand them. These sections, when they are returned to the wholeness of things, tend to stand out awkwardly and conspicuously. They are no longer a part of the oneness.

It is only when Oneness is reached that we have Enlightenment. This is our inner awareness of a higher order than that which is habitually exercised in acquiring relative knowledge. It is a faculty both intellectual and spiritual. Through this faculty, we break loose from the bounds of intellection. Intellection is necessarily dualistic because it always implies subject and object. But if we can view the "ten thousand things" in one thought, then there is no longer a separation between knower and known. Here, in this connection, Bradley says, too, that immediate experience opens the one road to the solution of ultimate prob-

lems. It is knowing and being in one, a direct awareness which is non-relational, and which is neither explainable nor describable. What then is this non-relational and inexpressible Oneness? It is the origin of all beauties, all truth, and all advancement. This viewing of all qualities in one thought which finally cuts off the hopelessly entangling logical mesh by merging all difference and likeness into the absolute oneness, has been stressed in the *Tao Te Ching*. In chapter 39 we read:

"In the ancient times there were those who achieved
the One.
Achieving the One, Heaven was made clear.
Achieving the One, Earth was made stable,
Achieving the One, God was made spiritual,
Achieving the One, the valleys were made full,
Achieving the One, all things lived and grew. . . .
All of them became so through the One.
Without purity, the Heavens would shake,
Without stability, the Earth would quake,
Without spirituality, God would crumble,
Without fulfillment, the valleys would crack,
Without the power of growth all things would perish."

Oneness, as Lao Tzu saw it, was the primordial source of all things, the Mother of the World. In the words that we have used, it is the harmony of harmonies, the highest sense of peace, which is invisible and unfathomable. Lao Tzu described it further in these words:

"The countenance of the Great Achievement
is simply a manifestation of Tao.
The thing that is called Tao
is elusive and evasive.
Evasive and elusive,
Yet latent in it are forms.
Elusive and evasive,
Yet latent in it are objects.
Dark and dim,
Yet latent in it is the essence.
The essence is quite real,
Therein is the vivid truth.
From ancient times until the present,
that which is called Tao has never ceased to exist.
Through it we see manifestations of all the admirables.
How do we understand the way in which
the admirables become admirable?
It is through Tao."

Tao is the Reality from which all admirables are manifested. Latent in it are forms, objects, essences, but it is formless and imageless of itself. We can understand it only through immediate intuition, not through intellection. When we refer to the explanation of peace by Whitehead, we can better understand this ancient idea. Whitehead says:

"There is the deep underlying Harmony of Nature, as it were a fluid, flexible support; and on its surface the ripples of social efforts, harmonizing and clashing in their aims at ways of satisfaction . . . amid the passing of so much beauty, so much heroism, so much daring. Peace is then the intuition of permanence." And further: "The essence of Peace is that the individual whose strength of experience is founded upon this ultimate intuition thereby is extending the influences of the source of all order."[6]

Now we see both the Eastern and the Western philosophers lead us to believe that the essential truth that peace demands is the conformation of Appearance to Reality. There is the absolute Reality from which all multiplicities spring. Further, Reality cannot be reached by rational analysis, but only by immediate intuition, or enlightenment.

According to Taoist philosophers, such as Lao Tzu and Chuang Tzu, Enlightenment is a growing consciousness of a new power in the mind. To them the opening out of the mind through the confrontation of the unexpected is like opening a door onto a new world of experience. There is no need for logical analysis or even meditation. There are unknown recesses in our minds which lie beyond the threshold of intellectual construction of consciousness. Whatever field of consciousness is known to us is generally filled with stereotyped conceptions. To rid ourselves of these, Chinese Taoists say we must move to some nearly inaccessible region of the mind, to which they can only point. The experience is something like this: a tap sounds at the gate of consciousness, and though the door be tightly locked, the sound reverberates throughout the entire being of the individual.

As long as the mind is not free to perceive this fountain of life in this inaccessible region, we are divided against ourselves. Instead of grasping the key to the secrets of creation, the mind is hopelessly buried in the superficiality of things. There is a story from the classics of a meeting of Confucius and Lao Tzu. When Confucius, not yet having achieved Tao, went south to see Lao Tzu, he was asked: "I hear that you are the wise man from the North; have you also received the Tao?" "Not yet," Confucius replied. The other went on, "How have you sought it?" Confucius said: "I sought it in rituals and rules, and after five years I had not yet achieved it."—"And how then did you seek it?" "I sought it in the principles of Yin-Yang, but after twelve years I had not yet found it." Lao Tzu then explained: "The reason why the Tao cannot be transmitted is none other than this: if there is not a presiding center within, it will not remain there." Lao Tzu continued: "It is fortunate that you have not met with a ruler fit to rule the world. The Six Classics which you mentioned are but the wornout footprints of the sages of the past. The footprints were made by the shoes, but they are not the shoes themselves. Hawks stare at one another and without moving their eyes their young are conceived. There is a male insect which chirps with the wind while the female chirps against it, and their young are thereby produced. There are hermaphroditic animals which produce their own young independently." It was said that Confucius reflected upon these re-

marks for a period of three months and then returned to Lao Tzu and said: "Magpies and their kind hatch out their young from eggs. Fish reproduce their kind by the impregnation of their own milt. The wasp gives rise to itself by the process of metamorphosis. When the younger brother is born, the elder brother cries." Lao Tzu was so pleased with his answer that he exclaimed: "It is well indeed! You have grasped the Tao."[7]

This dialogue seems illogical and nonsensical to us. Yet it was by means of this that the mind of Confucius, according to Chuang Tzu, was unfolded to the full bloom of enlightenment. Confucius' former methods of learning were built upon a logical basis and approachable through rationality, but they were of no assistance to him in his spiritual life. Lao Tzu was thoroughly aware of what Confucius failed to see; that he was hopelessly trapped in the realm of relativity and superficiality, and was not free to dive into the recesses of the mind where no logical analysis can ever be reached. An iron wall was needed to block his every intellectual effort. Lao Tzu's nonsensical statements concerning the reproduction of hawks, insects and animals served to build that iron wall. Thus the march of thoughts from Confucius' former habitual consciousness was suddenly excluded. Troubled and agitated, he wanted to break through the wall. Throwing his entire being into the deepest resources of his nature unexpectedly opened up an unknown region in his mind; it was the birth of a new consciousness, which was truly beyond mere intellection. After three months of "self-cultivation" Confucius returned to Lao Tzu and made the same kind of unconventional statement as had his master Lao Tzu: "When the younger brother is born, the elder brother cries."

This way of awakening the new consciousness is direct and far beyond the approach of intellectual analysis. It also saves the learner from sinking into a trance and becoming absorbed in mere contemplation.

If one seeks merely for the transcendental, it can be attained, but the process may sever you from the world. This is simple annihilation of the self. For those who are in the prison of the relative world, the approach of "beyond the opposites" would open the "third eye," in order to transcend earth-bound relativity, and enter into the realm of Infinite. But when one is trapped, due to one's own aspirations for the Infinite, then the key to enlightenment is to bring one back to life itself. The secret cannot be found in intellectual abstraction and metaphysical subtlety; the truth of Tao really lies in the concrete realities of our daily activities.

This idea of naturalness was further applied to human relations by neo-Confucianists. As Wan Yang-ming of the fifteenth century said: "According to Confucianism, between father and son we find love; between ruler and subordinates, righteousness; while with husband and wife, each pursues his own duty. How can we say that there is an attachment through a relationship so natural as that between father and son, ruler and subordinate, husband and wife?" This conception of naturalness was particularly stressed by Taoist philosophers.

We may turn to a simple and amusing story to learn a basic lesson. A student of Zen approached his Master one morning with the question, "What is the essence of Zen?" In turn, the Master asked, "Have you finished your breakfast?" "Yes," was the reply. "Then," answered the Master, "go and wash your dishes." The Master was not being flippant or indifferent. He was simply saying that it is naturalness that leads to enlightenment. As Kuo Hsiang, the neo-Taoist philosopher of the third century, once said: "The universe has all things as its content, and all things must take 'self-so-ness' as their norm. What is spontaneously so, and not made to be so, is naturalness."

I should like to illustrate this by the following analogy in the second chapter of the works of Chuang Tzu:

"The breath of the Great Earth," says Tzu Ch'i, "is called the wind. At times it is merely inactive. But when it is in action, the ten thousand crevices of the earth resound and roll with a mighty roar. Have you not heard it in the outburst of a gale? In the projecting bluff of the mountain forest, the hollows of the huge trees are like nostrils, mouths, and ears, others like beam sockets, goblets, mortars, or pools and puddles. The wind whirls through them, like swirling torrents of whizzing arrows bellowing, shouting, trilling, wailing, moaning, roaring, purling. . . . Finally the tempest is over and all crevices became quiet and still. . . ."

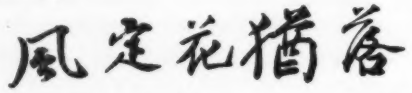
"Now," asked Tzu Yu, "since you said that the music of Earth comes from the sounds made by the hollows and crevices, and that the music of Man comes from bamboo pipes and flutes, I venture to ask of what consists the music of Heaven." "The Heavenly music," Tzu Ch'i answers, "blows through ten thousand apertures and through each in a different way. Each of them is self-assertive. What need have they for any agency to excite them?"

What, then, is the Music of Heaven? It is nothing more than the music of Earth and the music of Man asserting themselves. In the relative sense, we see the difference between the music of Earth and the music of Man. But in the highest sense there is a unity, or harmony, between them. When each, whether Earth or Man, spontaneously fulfills its natural capacity, the Great Harmony is attained. Self-assertion is identified with diversity, yet within all diversities there is unity. Unity is invisible, and diversity is tangible. Without diversities there is no expression of unity. Without the invisible unity there is no possibility of the Great Harmony. Whitehead says: "The Great Harmony is the Harmony of enduring individualities connected in the unity of background. It is for this reason that the notion of freedom haunts the higher civilizations. For freedom in any one of its many senses is the claim for vigorous self-assertion."[8] This is what Chuang Tzu implied when he speaks of the music of Earth and the music of Man in con-

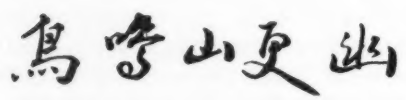
nection with the "unified background" of the music of Heaven.

This parable of Chuang Tzu has not been very well understood. An interpretative commentary by the great seventeenth-century scholar Yao-Nai, however, provides an enlightening vision: "To a man who has achieved the Self of Non-Self, all music, whether from pipes or flutes or the wind through nature's apertures, is Heavenly music. But to the man who has not achieved this Non-Self, these sounds are still heard as the Music of Man and the Music of Earth."

Two lines from ancient Chinese poetry may serve as appropriate ending:



"The wind ceases and yet the blossoms fall.



The birds are singing, and the valley is still more silent."

These two lines were written before the fifth century by two different poets. In the eleventh century Wang An-shih (1021-1086), a famous scholar and statesman, paralleled them as a couplet and offered an interpretation. The first line, he said, indicates action within non-action; the second line non-action within action. His interpretation revealed the underlying harmony of our two poets and the feelings which they expressed in their rhythms. An important point, however, is that the two poets were children. The first line was written by Hsieh Chen when he was only eight years old. Their commentator, Wang An-shih, was an old retired gentleman, who penetrated into the depths of the hearts of these young poets who had lived six hundred years before him. This fact tells us that there is an interfusion between the inner harmony of a child whose innocence and simplicity have not yet been tainted and the wisdom of an old man who reverts to the simplicity and innocence of childhood. When we understand this and reflect immediately, into our own experience, the harmony of action within non-action and non-action within action, we feel ourselves at one with both our poets and their commentator, who in his turn is separated from us by another nine hundred years. What is this power of interfusion, free from limitations of time and space? Is it not the highest peace in action?

References

1. Laurence Binyon, *The Spirit of Man in Asian Art*, p. 98.
2. *Ibid.*, p. 99.
3. Alfred N. Whitehead, *Process and Reality*, p. 124.
4. F. H. Bradley, *Appearance and Reality*, p. 489.
5. *Ibid.*, p. 493.
6. A. N. Whitehead, *Adventures of Ideas*, p. 369.
7. Chuang Tzu, chap. 14.
8. Whitehead, *Adventures of Ideas*, p. 362.

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U. A. ASRANI

*A Modern Approach to Mystical Experience**

SOME CONSIDERATIONS WHICH MAKE POSSIBLE A WIDER DISCUSSION OF MYSTICISM IN SCIENTIFIC TERMS

IT WAS IN 1943, when I was in political detention in prison, that I had a peculiar psychological experience. I had received certain very depressing news from home which I could do nothing about; as a result I felt very depressed indeed. But from that despondence was born, the next morning, a new mood —free, buoyant, unmoved, unconcerned with self and with all desires and attachments. This state of mind lasted about forty-eight hours, and then gradually faded away. But several times thereafter repetitions of this attitude have occurred for shorter periods.

This temporary personal experience culminated about thirty-five years of Jnana Yoga Sadhana, that is, the practice of that form of yoga whose method is based upon philosophical reasoning and meditation, as contrasted with other yoga methods of selfless activity, physiological exercises, or emotional involvement. The experience was akin to what the *Bhagavad Gita* describes as the Sthita Prajna state, or condition of mental stability, which is an object of all yoga. The *Gita* speaks of it thus: (Verses II 55 to 65)

55. Sri Bhagwan (Krishna) said, Arjuna, when one thoroughly abandons all cravings of the mind, and is satisfied in the self, through the self, then he is called Stable of Mind.
56. The sage, whose mind remains unperturbed in sorrows, whose thirst for pleasure has altogether disappeared, and who is free from passion, fear and anger, is called Stable of Mind.
57. He who is unattached to everything, and meeting with good and evil, neither rejoices nor recoils, his Mind is Stable.
58. When like a tortoise, which draws in its limbs from all directions, he withdraws his senses from sense-objects, his Mind becomes Stable.
59. Sense-objects cease for him who does not enjoy them with his senses; but the taste for them persists. This relish also disappears in the case of the man of Stable Mind, when he sees the Supreme.
60. Turbulent by nature, the senses even of a wise man, who is practising self-control, forcibly carry away his mind, Arjuna.
61. Therefore, having controlled them all, and collecting his mind, one

*This article is an abridgement by E. B. Sellon, based upon a much fuller paper, with the author's kind consent. The original version appeared under the title, "A Synthesis of Science and Mysticism is Possible," in *Shiksha*, the journal of the Education Department, Uttar Pradesh, India, July 1960, over the nom de plume "Zero," in accordance with a desire for anonymity. The author, who now permits the use of his name, was Assistant Professor of Physics at Benares Hindu University. He is at present a member of the Board of Basic Education of the Province of Uttar Pradesh.

should sit for meditation, devoting oneself, heart and soul to Me [i.e. God or the Supreme Reality]. For he whose senses are mastered, his Mind has become Stable.

62. The man dwelling on sense-objects develops attachment for them; from attachment springs up desire, and from [unfulfilled] desire ensues anger.
63. From anger arises infatuation; from infatuation, confusion of memory; from confusion of memory, loss of reason; and from loss of reason, one goes to complete ruin.
64. But the self-controlled practitioner, while enjoying the various sense-objects through the senses, which are disciplined and free from likes and dislikes, attains placidity of mind.
65. With the attainment of such placidity of mind, all his sorrows come to an end; and the intellect of such a person of tranquil mind soon withdraws itself from all sides, and becomes firmly established in the Supreme Reality.
66. He who has not controlled his mind and senses can have no determinate reason [or judgment]; nor can such an undisciplined man have belief [in One Supreme, all-pervading Reality or God, as against a belief in constantly conflicting and struggling individual selves]. The unbelieving man can have no peace, and how can there be happiness for one lacking peace of mind?
67. As the wind carries away a barge upon the waters, even so, out of the wandering senses, the one to which the mind is joined takes away his discrimination.
68. Therefore, Arjuna, he whose senses are completely restrained from their objects, his mind is Stable.
69. That which is night to all beings, in that state [of Divine Knowledge and Bliss] the God-Realized Yogi keeps awake. And that [the ever-changing transient worldly pleasure] in which all beings keep awake is night to the Seer.
70. As the waters [of different rivers] enter the ocean, which though full on all sides, remains undisturbed, likewise he, in whom all enjoyments merge themselves, attains peace; not he who hankers after such enjoyments.
71. He who gives up all desires, and moves free from attachments, egoism and thirst for enjoyment, attains peace.
72. Arjuna, such is the state of the God-Realized soul; having reached this state, he overcomes delusion. And established in this state, even at the last moment, he attains Brahmic Bliss [the bliss which comes from a conviction in the all-pervading Supreme Reality, called Brahman].

The experience of this condition, which may broadly be termed mystical experience, is in its lesser phases by no means uncommon. Gardner Murphy[1] has come to the conclusion that there is a regular continuum between the most spectacular of such experiences and those in which the ordinary man participates. My own experience was just the psychological recoil natural under such conditions for a mind long acquainted with mystical literature. Aldous Huxley[2] describes such experience in this way: "This kind of temporary self-transcendence is no guarantee of permanent enlightenment or a lasting improvement of conduct. It is a gratuitous grace," which is neither necessary, nor sufficient, for salvation, but which if properly used, can be enormously helpful to those who have received it. The writer entirely agrees with this evaluation, and the reader need not rate it any higher.

Aspects of the Sthita Prajna state which the *Gita* does not explicitly mention, but which are concomitants which the reader may find it of interest to check against the experience of other mystics are: (1) a feeling of buoyancy or carefreeness like the cheerfulness of a healthy child, but more stable; (2) concentration in all activities, even physical and physiological acts like eating; sleep comes quickly and easily; (3) living fully in the present, so that thought is not disjointed from action; (4) appreciation of the beauties of nature, or what seems to be a heightened aesthetic awareness or sensitivity; (5) a complete dispersal of the speculative philosophical tendency (so natural to a Vedantist); not a solution but a resolution or dissolution of all philosophical problems. (This last aspect was, I confess, a surprise to me.)

It occurred to me, then, that this kind of mystical experience not only concentrates and balances the mind; it also frees the self from such psychological states as superiority and inferiority, insecurity and fear, doubt and opinion, and egotism. It seems to be a state of perfect mental health, for the mind and its workings become so smooth and unperturbed that the very existence of the mind is not felt at all, just as the functioning of a perfectly healthy body is not felt. Moreover, physical health seems to improve, probably because mind and body, being in reality a single complex whole, become more integrated.

For these reasons, I have come to wonder if in this state of Sthita Prajna may not be found the answer to the demands which the atomic age now makes upon man: the need for a highly plastic mind which can face the challenge of a rapidly changing environment relieved of the tensions, frustrations and conflicts of modern society, together with a calm and balanced mind, unfettered by prejudices or prepossessions or attachments. In other words, the further development and wider sharing of such experience may be the next step in human evolution, necessitated by the demands of our age. There are certainly many indications that more and more people are showing interest in, and even searching for, such experience.

[1] In *Personality*, 1957
[2] In an article in *American Review*, Oct. 1959, "Drugs that Shape Men's Minds."

One such indication is the attention which is now being paid to the psycho-chemical or "mind-changing" drugs. Drugs, of course, have been used in all ages and in all cultures as aids to the attainment of mystical states. Reference is made to them even in the *Rig Veda*. However, most of the drugs used have had distinctly deleterious after-effects, both on body and mind, and therefore their utility has always been under question. Nevertheless, many mystics, rightly or wrongly, tolerated the use of drugs, and Patanjali himself mentioned that they *may* be an alternative method for the achievement of the initial stages.[3] He does not name the drugs, and the guesses of his commentators may or may not be correct; it would be erroneous to suppose he advocates their use. His system does refer to breathing exercises and other physiological practices; these, however, are only aids to other practices and in themselves are considered insufficient to lead to any real attainment.

The Hindus have long recognized that there are various methods of achieving mystical union or enlightenment, suited to different temperaments. The systems include the yoga of selfless action, surrendering the fruits of activity to God (Karma Yoga), the yoga of physiological exercises (Hatha Yoga) coupled with philosophical acceptance (Raja Yoga), the yoga of rational and philosophical meditation (Jnana Yoga), and the yoga of devotion to a personal God (Bhakti Yoga). Such a variety of methods reveals that there is in India a wide definition of mysticism itself—one that can, in addition, include Sufi (Islamic), Buddhist, Jain and Christian mysticism as all being perfectly genuine, and leading to the same goal.

The real question, therefore, is in what proportion and at what stage, in each individual case, is the use of these different methods justified, for all have their difficulties and their dangers. As to the physiological exercises, there are indications that when the practitioner is unsuited for them, they are to be avoided. Even devotional practices can tend to produce passivity and negativeness, while philosophical mediation can lead to intellectual self-complacency. Suffice it to say, the exploration of man's inner nature is fraught with difficulty. This should not deter us, but it should make us cautious. In India, the time-honored tradition has been to study under a wise teacher or *guru;* under modern conditions one would hope that at least adequate supervision and control would be exercised.

It is for research, it seems to me, to settle these and other problems, and no one should presume an answer without the fortification of much study and experiment. Patanjali definitely stated that his physiological practices were a preparation, not a goal. He himself discarded anything unconfirmed by actual experience; therefore one of the greatest authorities on mystical practices was not unacquainted with what we now call the scientific method. This should be enough to convince those who practise mysticism that modern techniques of scientific research could be helpful in determining the limitations, the after-effects, and the exact utility in different cases of different methods.

It seems to me that the time has come when a study of this kind becomes imperative. Having been a teacher of physics, as well as a devoted Vedantist, I have not failed to notice the tremendous challenge of modern materialistic hedonism—born of science and industrialization—not only to all spiritual effort, but also to ethics. The fear of God, as the prime mover of moral conduct, has been relegated, if not verbally at least virtually, to the realm of superstition. Mythology, religion and philosophy have become too multifaced to be serious rivals to science, with its definite though limited sphere of conclusions. Man has thus become a rudderless boat. Many modern thinkers, including the psychologist Jung and the historian Toynbee, have advocated a return to religion; yet if this return is to be successful, it must be in the nature of a new turn, which is in accord with modern science.[4]

If I offer the mystic condition, and the methods whereby it can be achieved, as a possible answer to the modern challenge, it is because, in the spirit of science, it can be tested by physiological and psychological means. Physiological studies can be and have been made to assess the effects of yogic and meditational practices on the heart, lungs, brain, glands, and other organs.[5] Psychological tests can evaluate mental and emotional states. If mysticism and mystical experience can be freed of their "supernatural" connotations, there is no reason why modern science cannot acknowledge and even absorb them into its domain. On the other hand, if the religious man will, on his side, submit to a scientific definition of mystical achievement, there is nothing to prevent the building of a bridge between science and mysticism. Modern man may then come to realize that the attainment of what may be called enlightenment or spirituality is a possibility which is scientifically valid, not just an unprovable religious belief. The spiritual life then becomes no longer a matter for the monk or priest, but an urgent and vital requirement for all men as the fulfillment of their real nature—a requirement not only for mental and physical health and for efficiency in action, but also for that balanced and dispassionate judgment which minimizes conflict and frustration in society, and for the attainment of a calm and beneficent goodwill

[3] Patanjali, *Yoga Aphorisms*, IV, 1, in any translation or edition.

[4] Such a new turn may be indicated in the work of Dr. Viktor Frankl, the psychiatrist, which he calls Logotherapy, or the medical treatment of men's souls.

[5] There have been a number of such tests. Some of the earliest were made in 1935 by Dr. Thérèse Brosse, with the cooperation of several yogis, the chief among them being Sriman Krishnamacharya, then on the faculty of the Maharaja's Sanskrit College, Mysore. (*Main Currents*, Vol. 4, No. 3, July 1946) Currently, yogic research on modern scientific lines is being carried out under the direction of Swami Kuvalayanda at Lonavla (Bombay State) and also under Dr. Anand in the All-India Institute of Medical Studies, New Delhi.

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The Hindus have long recognized that there are various methods of achieving mystical union or enlightenment, suited to different temperaments. The systems include the yoga of selfless action, surrendering the fruits of activity to God (Karma Yoga), the yoga of physiological exercises (Hatha Yoga) coupled with philosophical acceptance (Raja Yoga), the yoga of rational and philosophical meditation (Jnana Yoga), and the yoga of devotion to a personal God (Bhakti Yoga). Such a variety of methods reveals that there is in India a wide definition of mysticism itself—one that can, in addition, include Sufi (Islamic), Buddhist, Jain and Christian mysticism as all being perfectly genuine, and leading to the same goal.

The real question, therefore, is in what proportion and at what stage, in each individual case, is the use of these different methods justified, for all have their difficulties and their dangers. As to the physiological exercises, there are indications that when the practitioner is unsuited for them, they are to be avoided. Even devotional practices can tend to produce passivity and negativeness, while philosophical mediation can lead to intellectual self-complacency. Suffice it to say, the exploration of man's inner nature is fraught with difficulty. This should not deter us, but it should make us cautious. In India, the time-honored tradition has been to study under a wise teacher or *guru;* under modern conditions one would hope that at least adequate supervision and control would be exercised.

It is for research, it seems to me, to settle these and other problems, and no one should presume an answer without the fortification of much study and experiment. Patanjali definitely stated that his physiological practices were a preparation, not a goal. He himself discarded anything unconfirmed by actual experience; therefore one of the greatest authorities on mystical practices was not unacquainted with what we now call the scientific method. This should be enough to convince those who practise mysticism that modern techniques of scientific research could be helpful in determining the limitations, the after-effects, and the exact utility in different cases of different methods.

It seems to me that the time has come when a study of this kind becomes imperative. Having been a teacher of physics, as well as a devoted Vedantist, I have not failed to notice the tremendous challenge of modern materialistic hedonism—born of science and industrialization—not only to all spiritual effort, but also to ethics. The fear of God, as the prime mover of moral conduct, has been relegated, if not verbally at least virtually, to the realm of superstition. Mythology, religion and philosophy have become too multifaced to be serious rivals to science, with its definite though limited sphere of conclusions. Man has thus become a rudderless boat. Many modern thinkers, including the psychologist Jung and the historian Toynbee, have advocated a return to religion; yet if this return is to be successful, it must be in the nature of a new turn, which is in accord with modern science.[4]

If I offer the mystic condition, and the methods whereby it can be achieved, as a possible answer to the modern challenge, it is because, in the spirit of science, it can be tested by physiological and psychological means. Physiological studies can be and have been made to assess the effects of yogic and meditational practices on the heart, lungs, brain, glands, and other organs.[5] Psychological tests can evaluate mental and emotional states. If mysticism and mystical experience can be freed of their "supernatural" connotations, there is no reason why modern science cannot acknowledge and even absorb them into its domain. On the other hand, if the religious man will, on his side, submit to a scientific definition of mystical achievement, there is nothing to prevent the building of a bridge between science and mysticism. Modern man may then come to realize that the attainment of what may be called enlightenment or spirituality is a possibility which is scientifically valid, not just an unprovable religious belief. The spiritual life then becomes no longer a matter for the monk or priest, but an urgent and vital requirement for all men as the fulfillment of their real nature—a requirement not only for mental and physical health and for efficiency in action, but also for that balanced and dispassionate judgment which minimizes conflict and frustration in society, and for the attainment of a calm and beneficent goodwill

[3] Patanjali, *Yoga Aphorisms,* IV, 1, in any translation or edition.

[4] Such a new turn may be indicated in the work of Dr. Viktor Frankl, the psychiatrist, which he calls Logotherapy, or the medical treatment of men's souls.

[5] There have been a number of such tests. Some of the earliest were made in 1935 by Dr. Thérèse Brosse, with the cooperation of several yogis, the chief among them being Sriman Krishnamacharya, then on the faculty of the Maharaja's Sanskrit College, Mysore. (*Main Currents,* Vol. 4, No. 3, July 1946) Currently, yogic research on modern scientific lines is being carried out under the direction of Swami Kuvalayanda at Lonavla (Bombay State) and also under Dr. Anand in the All-India Institute of Medical Studies, New Delhi.

which leads to altruistic action. The spiritual life can be, in fact, not other-worldly but this-worldly, and in very potent fashion. To the young person it offers a challenge for personal growth, and to the educator it reveals one of the developing points of the species homo sapiens in its evolutionary drive. To society, moreover, it offers the possibility of an experiential basis for action to replace the shaken belief in a moral system founded on religious dogma alone.

The Sthitha Prajna state, like that which is the object of all mysticism, is not inaction but rather effortlessly regulated action—equilibrium based on non-attachment. It does not presuppose that the senses, feelings, instincts and so on are to be stifled or repressed (which only leads to their proliferation into other and even more undesirable channels) but to be effortlessly ordered and balanced by a mind free from prejudices and prepossessions. The means to achieve this state is what Patanjali calls *pratyahara*, i.e., the capacity for withdrawal of the agencies of the self—mind, senses, feelings—when the work at hand is done, and even the withdrawal of the ego at will. Relaxation, after tension.

If one surveys the whole spectrum of yoga or mysticism, with its variety of systems, one cannot but notice that this capacity for withdrawal appears to be a feature common to all. *Pratyahara* is the fifth stage of Patanjali's system, followed by the three stages of deep concentration known as *dharana, dhyana* and *samadhi*. There are different ways of attaining this state, all perfectly valid. Thus Karma Yoga achieves the withdrawal by renouncing the fruits of action, and Jnana Yoga by regarding all activity as *maya* (illusion) or mere sport (*lila*). A Bhakta dedicates all his activity to the Lord, sublimating his unbridled emotional drives by substituting in their place a unified and strong emotion, the love of a personal God. This also seems to be the method most favored by Christian mystics. Repetition of *Ram-nam* (the name of the Lord) or concentration upon the breath, as practised by Buddhists, seem by rhythmic monotony to tranquilize and still the mind; Vedantic meditations by their wider outlook also disperse or diminish its activity. The result in each case is the attainment of a quiet, or interior silence, which helps to lead the mind to *pratyahara,* or withdrawal.

The question now arises, what effect does the achievement of even partial *pratyahara* have upon the individual?

There is some evidence (unfortunately not gathered very systematically as yet) that the *pratyahara* state yields beneficial physiological effects. When the mind of the practitioner is quieted by meditation or by the rhythmic chanting of the sacred name (Ram-nam) or some other technique, there seems to be a release of extra energy in the body, especially at any part which happens to be in less than perfect health. If one begins meditation fatigued, there is a sense of refreshment and renewed vitality. The exact physiological mechanisms which effect this release of energy have not been identified, so I cannot say whether the relief is caused by glandular, circulatory or electrical phenomena. Nonetheless, there is testimony to the fact that minor (not chronic or acute) physical distresses can be alleviated; for example, Mahatma Gandhi regularly used Ram-nam as a healer in his Nature Cure methods.

This theory and whatever evidence substantiates it should be subjected to psychological and physiological tests, for if it is proven that such simple practices can yield a higher level of ordinary well-being, that in itself would surely be a gain for humanity.

Second, it seems evident that yoga practices have psychological effects. Psychologists have listed methods by which a frustrated mind tends to fortify itself. In his book *Personality*, Gardner Murphy mentions two methods of escape from frustration and mental conflict, which may be used by the healthy as well as the neurotic individual; (1) dissociation of personality in two unintegrated parts, the self encouraging the one and disguising and despising the other. Owing to lack of integration, this method is unhealthy; (2) so regrouping or renaming the frustrating circumstances as to permit an integrated response. It is remarkable that the Advaita Vedanta philosophy offers the kind of fortification which is described in this second method. By identifying *Jiva* (the individual living self) with *Brahman* (ultimate Reality) and calling the frustrating universe *Maya* (the illusion of relativity), it supplies just the psychological mechanisms that remove frustration by renaming the circumstances; and the mechanisms are at a socially respected level.

An important question is whether the practice of mysticism by any of the various methods of meditation or exercise which have been mentioned can effect a *permanent* change in personality. It is common experience that temporary change can result from prayer or other devotional exercises, but a new mood can also result from the use of tranquilizing drugs or even such things as the imbibing of tea or coffee, a walk in the open, talk with friends, or a visit to the cinema. Obviously we wish to know whether the changes effected in personality by yoga or mystical methods can result in permanent growth.

History has certainly recorded (and I myself have witnessed) some very remarkable instances in which a mystical experience has effected a sudden transformation of the self, and a complete break with the past. (See Myers' *Human Personality* and Bucke's *Cosmic Consciousness* for examples.) However, there is a much larger number of cases in which the change is gradual and slow, though none the less pronounced if we but compare the individual with what he was ten or twenty years previously. Nor can this change be attributed merely to maturity, else all should achieve equanimity and wisdom with age, and we know that this is certainly not the case. In these instances of gradual rather than instant conversion, the process seems to be an assimilative and educative one. In any event, those who have long and consistently and devotedly

(with their whole heart) practised meditation or other similar techniques do seem, on balance, to exhibit many of those same characteristics which the psychologist Maslow has characterized as self-actualizing, i.e., equanimity, cheerfulness, balance, openness and self-reliance, to say nothing of such other qualities as unselfishness, lack of egotism, impersonality and love.

Another important question that arises in this connection is this: Aside from unknown side-effects, does the present position of our knowledge of the psychedelic drugs warrant the conclusion that they, by themselves, can effect such long-range personality changes, and thus solve man's psychological problems, without recourse to other methods? I myself think not, for the following reasons.

Present evidence seems to indicate that while the drugs appear to yield feelings of universality, love, and a temporary dissolving of the ego, they do not permit penetration of the highest functions of the self, such as conscience, wisdom or insight, spirituality, independence, judgment, creativity, and so on. The subjects of the psychedelic experience appear to be merely passive or receptive. There can undoubtedly be a feeling of expanded well-being, but it is not the subject's own achievement, self-engendered and self-controlled. It is therefore rather negative: valuable in some cases as preparation, but not attainment. Experiments so far show that chemicals can assist to what is, to the individual, an "abnormal" state of consciousness akin to mystical experience, but what mysticism itself tries to achieve is such an expansion as *normal*. Does it seem completely normal or healthy for an individual to have to depend on external stimulants for his inner well-being? Our age tempts us to believe it is, but I myself have grave doubts. For example, the tranquilizing drugs appear to be harmless and many take them daily, but the need for such agents stems from an abnormal situation in our culture and in ourselves, and once the situation is changed and the pressure on the individual is relieved, the need for tranquilizers should vanish.

For some thousands of years, drugs have been known and used for the alleviation of all sorts of illnesses. Some are very potent. But most physicians have always felt that these drugs were not in themselves healers, but were rather aids to nature's own healing mechanisms. In acute distress, such an aid may be essential, but in the end, it is nature's recuperative forces which restore the organism to health. Repeated doses of drugs, we know, tend to follow the law of diminishing returns, reducing the body's natural recuperative capacity and making a recurrence of the disease easier. There is some danger that the same thing may be true of the mind-changing drugs. Moreover, their widely varying effects point up the fact that human minds, like human bodies, are so complex that it is most unlikely that any single method could meet all human requirements. Genetic and environmental considerations aside, there are cogent reasons for thinking that the time-honored religio-mystical methods hold out better prospects for man's self-transformation, if they can but be adapted to a modern context. For they take due cognizance of the individuality and independence of man, which, in the long run, make him revolt against dependence upon anything but his own resources. The uniqueness and integrity of the self are truly the mark of man; thus dependence upon drugs or other external stimuli will not be permanently satisfying to him. And, what is perhaps most important of all, religio-mystical methods all put strong emphasis upon the necessity of leading an ethical and selfless life, so that the insights received may be tested and validated by daily experience. Unfortunately, the drug experience seems to have been undertaken by most experimentors either for therapeutic reasons or for their own pleasure and satisfaction, and not from any higher motives.

In this connection, it seems proper to inquire whether we are justified in setting the goal of mysticism or yoga as a state of increased physical well-being and mental health. This may seem enough to a large majority of people, but there are those who devote themselves to such effort for larger reasons, and who feel that the struggle to attain personal insight is not merely a selfish or self-centered pursuit, but one which can be of benefit to all of humanity. Such a view, which forms part of that of such teachers as Krishnamurti, holds that society is composed of individuals, and therefore the individual alone can transform society. Those who devote themselves to this search can and do attain greater heights than the values previously mentioned. Therefore, a further question to be considered is whether such mystics really do achieve any intuitions or revelations which can be depended upon for a truer or more comprehensive picture of reality than the material sciences can offer. (For the sciences furnish us with the most widely accepted criteria.) This question is difficult to answer, for it poses several problems which have wide ramifications. I shall, however, try to give a concrete reply, after indicating some important considerations.

First, it may be said that some yogis and mystics do achieve what may be called "supernormal" powers. Modern parapsychology has made extensive studies of the extrasensory perceptions of even so-called normal minds. Field theory, as applied to psychological states, does not accept the concept of a static and constant personality (*jiva*), confined to the limits of a physical mechanism, but rather regards it as a dynamic or developing "node" in a social and psychological field on which it constantly acts and which constantly acts upon it.[6] It is also observed that this postulated psychological field extends not only throughout space but also throughout time, including the

[6] See Gardner Murphy's article, "Field Theory and Survival," in the *Indian Journal of Psychology*, September 1959. Western readers now have access to a considerable accumulation of material on the subject of field theory related to life, which ranges from electrodynamic concepts to Dr. Murphy's broader postulate. See, for example, *Main Currents*, Vol. 19, No. 1; also "Space-Time Spun Out," by Winifred Duncan, in Vol. 13, No. 1.

future. The presence of a field of this kind offers a creditable explanation for such otherwise inexplicable effects as telepathy, clairvoyance, precognition, faith healing, and so on, all of which are frequently associated with mystics. Other abilities which some yogis develop recall powers of lower animals which man and most mammals have lost in their evolutionary march; e.g., the capacity to arrest or suppress the heartbeat for some time is akin to the hibernation of serpents. Some yoga practices probably give a degree of control over the sympathetic and parasympathetic nervous systems, making possible such an evolutionary reversion to hibernation or to the instinctual capacities of birds. These and other abilities seem open to explanation, but there are additional feats which yogis have demonstrated, such as levitation, which are more difficult to explain in scientific terms. Some are also remarkable healers, clairvoyants, and so on.

On the other hand, most true mystics and yogis discount psychic powers and phenomena, saying that they are incidental and of little importance, and all great teachers, from the Buddha downward, have decried the search for such powers. It is well that manifestations of this kind should be studied by science as they occur, if for no other reason than that they indicate the complex nature of man and of consciousness. But one should bear in mind that these phenomena do not, in themselves, yield any deeper perception of reality, nor do they indicate a high degree of spirituality or enlightenment. The achievements are interesting, but no more so than are innumerable scientific discoveries and inventions, and like these, they appear to give ground in the face of material and historical forces. They have their own limits. In other words, such phenomena may be supernormal or superphysical, but they are not in themselves "spiritual." Neither, I venture to say, will they be regarded as "supernatural," once we have been able to distinguish what laws of nature they utilize and conform to; for since they have material results, they must accomplish these in some way that is consonant with the order of nature. Indeed they may, in time, prove to be just as natural to man as many other things which once seemed marvelous but which we now take as a matter of course.

Such powers belong to what we generally identify as the psychic or mental domain—that same rather diffuse area in which all thought and speculation take place. Mystic experience, however, is distinguished by its overpowering immediacy, and thus has been variously called supermental, intuitive or aesthetic. It is of interest to note that, historically, few mystics (and these only the very greatest) have been able to formulate their own ineffable experience into concepts which added anything of moment to the philosophy or theology or science of their own times. This does not mean that the experiences lacked validity, or that they were not a transforming power in the life of the individual, but rather that it was impossible for mystics to formulate their experience of reality in logical, conceptually communicable terms. On a somewhat different level, the same situation is paralleled with regard to science's view of reality, for such things as "fundamental particles" (matter-energy entities), the space-time continuum, gravitational action, etc., can only be described appropriately in terms of new mathematical agencies, wave and quantum mechanics, and non-Euclidean geometry. They cannot be described in linguistic or in common-sense terms adequate to convey their true nature. Therefore we should not be surprised that the mystic is not able to convey his own experience of reality in logical terms, nor should we judge his experience invalid because of this failure.

In view of this situation, we must regard all systems of philosophy, including those based upon intuitions or revelations, as falling short of the truth. It is no wonder, therefore, that different schools of philosophy and different religions have failed to achieve a synthetic solution, for such solution is sought not at the level of reality from which religion flows (or even at that which science has proven) but rather at the level of logic, doctrine and intellectual compromise. We acknowledge that knowledge is never final, yet our tendency to make hypothetical analytical distinctions limits the progress and accuracy of our knowledge. Does this mean that, like the logical positivists, we restrict knowledge to facts alone, without recourse to the concepts which give them meaning and relevance? Of course not, but a valid metaphysics must be grounded in experience, just as the a priori notions on which science is based are tested experimentally, and thereafter generate the concepts with which we regularize experience. It is the experiential and therefore experimental character of mysticism which, it seems to me, makes possible its juncture with modern science.

Both science and mysticism affirm a reality which is not confined to the superficial, dynamic, changing phenomena which we observe. The mystic attests the value and importance of his experience of reality as a catalyst in his own life; he should be willing to submit to those tests which will substantiate his affirmation of the validity of his experience. This may not be an easy or agreeable thing to do, yet if the mystic has been brought through his own experience to an acknowledgment of his unity with his fellow man and indeed with all life, that in itself implies an obligation to society which must be discharged in ways that are consonant with society's needs. In our own time, these needs are stated in terms that accord with the scientific temper of the day. Let science, then, on its part, approach the problem of mystical experience with the same detached interest it has shown toward the investigation of other natural phenomena—without judging or condemning it in advance as neurotic or hallucinatory.

It is possible that in this way we may achieve new knowledge about man as an evolutionary force.

THERESE BROSSE

The Power of Consciousness

A STUDY OF THE CONSCIOUS CONTROL OF PHYSIOLOGICAL FUNCTIONS

EVERY PRACTICING PHYSICIAN knows from observation that as emotion aggravates diabetes, or epilepsy, or eczema, so will an emotional shock release by its repetition not only the gamut of aches and pains and fainting spells, but also arterial spasms and more objective disturbances of rhythm. As progressive intoxication brings a train of effects, so the slow traumatic effects of the emotions bring about functional crises in a healthy organism and exaggerate them in an unhealthy one. A burst of joy or a fit of anger can result in an oedema of the lung, a stroke, even a fatal fainting spell. On the other hand, conscious will can intervene to permit the organism, even while suffering from an organic disease, to make an effort apparently no longer within its capacity. Thus one can observe purely functional diseases disappear completely in patients when life brutally demands of them an effort of concentration requiring the full play of their energies at different levels.

In reference to the circulatory system, interesting experimental conclusions were reported in 1914 by the physiologist Wenckebach, who established the relationship between respiratory arrhythmia and the activities of consciousness. Sustained attention diverts the arrhythmia or makes it disappear. Inattention induces it or exaggerates it. In this connection the author reports the curious observations of the psychiatrist Wiermsa that melancholics (whose psychic activity is intense) have a regular cardiac rhythm; neurasthenics (whose attention is variable) suffer a great deal from respiratory arrhythmia. Wiermsa observed two students, suffering from this arrhythmia, in whom it disappeared during the examination period when their cerebral activity was at its maximum. Thus by the condition of the pulse it was possible to measure the intensity of conscious concentration. Respiratory arrhythmia (sinus arrhythmia) is physiological in childhood and youth, the age when thoughts wander. This same condition is to be found among animals, and in those human subjects whose mind and emotions are not directed by conscious autonomy, whose cerebral activity is closer to the lower mammals. Seen in the light of these data, respiratory arrhythmia appears, according to the conception of Frederick Muller, as a reflex controlled by the stimulating or inhibiting action of the higher centers. In the same way as in the eliciting of the common patellar reflex, the attention of the subject must be diverted if the physician is to detect it. When the connections with the cortex are interrupted, it becomes exaggerated.

It is in order to fix exactly this role of conscious dynamism in physiology in general, and more particularly circulatory physiology, that we conducted at the Broussais Hospital the series of experiments whose technique and results will be briefly noted.

In a series of subjects either normal or neurotic and showing sometimes a regular pulse, sometimes a variable type of arrhythmia (respiratory, sinusal, systolic), we asked each subject to perform an act of clear conscious concentration, such as a mental multiplication or the recall of a pleasant memory. The humeral or radial arterial tracing, recorded either on smoked paper or on the photosensitized paper of the electrocardiagram at the same time as the latter, was taken without discontinuity before, during, and after the experiment. The record shows among the patients two types of psychic reactions. While some performed this test correctly, others, being disturbed, divided their attention between fear and mental application and thus exaggerated experimentally their state of emotional diffusion. We were able therefore to record the arterial reactions during concentration, on the one hand, and during the period of emotion, on the other. The results were as follows:

1. With the neurotics predisposed to functional arrhythmias, concentration caused the arrhythmia to disappear from the record during the experiment (Figures I, II, III). Diffused emotion accentuated it or made it appear when the pulse was regular during the preceding moments (Figure IV). On the succeeding trial, the subject, in the act of concentration, corrected an arrhythmia which had been induced by the emotional upset of the first attempt.

2. Even in the absence of arrhythmia the two kinds of psychic reaction brought about different arterial results: (a) *Concentration* of thought induced an hypertonic type of arterial reaction, with an accentuation of the detail of the systolic and diastolic waves (fig. V). A like result is caused by the immersion of the arm in cold water. (b) *Diffusion* of emotion, on the contrary was accompanied by a reaction of hypotonic type, with curves indefinite and spread out (fig. VI), such as is caused by the immersion of the arm in warm water. This last reaction is also obtained by arterial fatigue following long major compres-

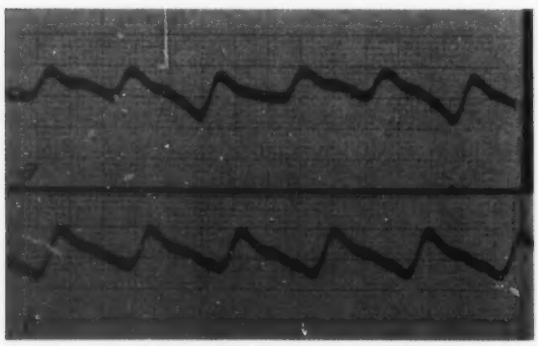
sions of the artery; the same reaction is again recorded, but contralaterally, when the fatigue of a weight to be supported is imposed upon the segment of arm on the opposite side.

3. Finally, rare subjects could at will modify the rhythm of the pulse directly, either by slowing or acceleration.

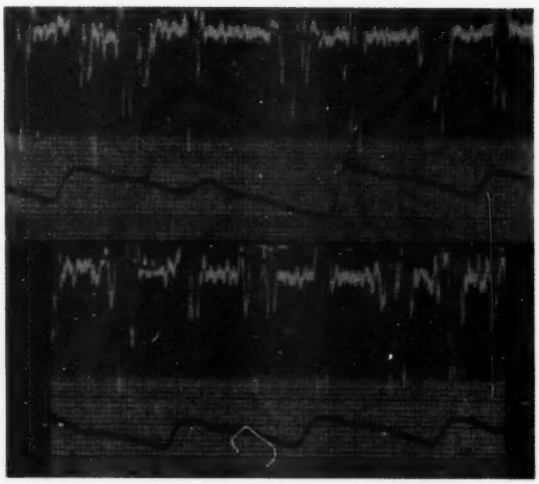
The result of these experiments confirmed therefore that disturbed emotions cause physiological disorders and that, on the other hand, conscious control by the patient has a beneficient action on the autonomic system. From this it would seem to follow that one could re-educate the patient by asking him to live more constantly in this state of psychic discipline whose corollary is the regularization of the vegetative functions.

These clinical findings were not alone confirmed by experimental tests, but were also justified by what we know of the encephalon and its nervous channels, according to the most recent data of anatomy. It has been established that there exist in the brain three differentiated levels of psycho-physiological activities: the cortex area of intellection; the midbrain containing the centers of emotions, in close connection with the hypophysis (the glandular organ situated at the base of the cranium); the medullary zone, or lower center of automatic vegetative life. Upon the intercommunications of these different areas recent discoveries bring us most important documentation, due to the discovery of centers and fibers of the sympathetic system far beyond the lower stage and infiltrating in the zones from which it at first was believed to be completely independent. A number of sympathetic ganglia in the diencephalon explain the repercussions of emotions on physiological life, and fibers within the cortex account for the checking and regulating action of the cortex in vegetative phenomena. Thus the autonomic nervous system is not completely independent of the cerebro-spinal nervous system, but on the contrary, insures the interaction of all these zones of psycho-physiological activity which can be classified into a hierarchy, but cannot be isolated one from the other in the sum total of human life.

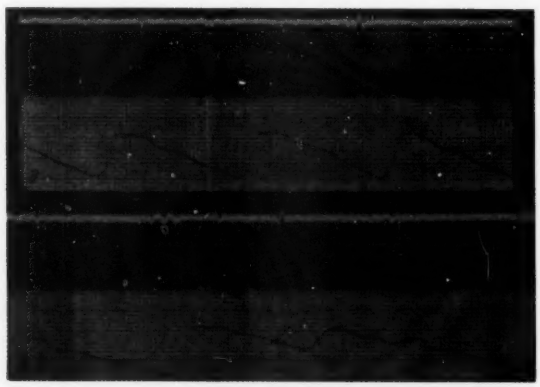
I Subject: 17 years old. The tracing represents the two curves, one above the other, of the pulse (below) and the breathing: (a) During a period of mental diffusion: respiratory arrhythmia. (b) During a period of concentration: regularization of the pulse.



II Modification of a sinusal anisophygmia (inequality of the pulse either in volume, time, or force in the symmetrical arteries of the body) under the influence of mental concentration: (a) During a period of mental diffusion (immediately before the test): irregularity. (b) During a period of concentration (during the test): regularization.



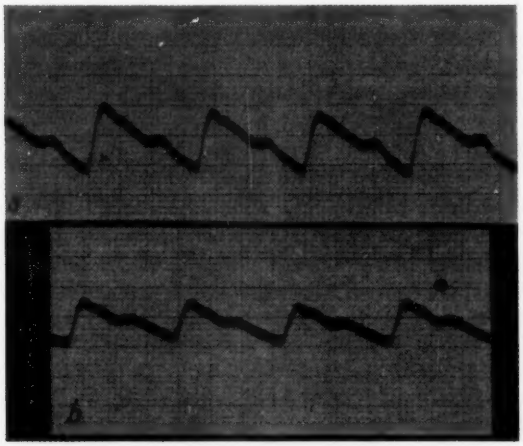
III (a) Extra-systoles during a period of mental diffusion. (b) Regularization during concentration. A phonocardiogram (graphic record of heart sound) recorded simultaneously is added above to each of the tracings.



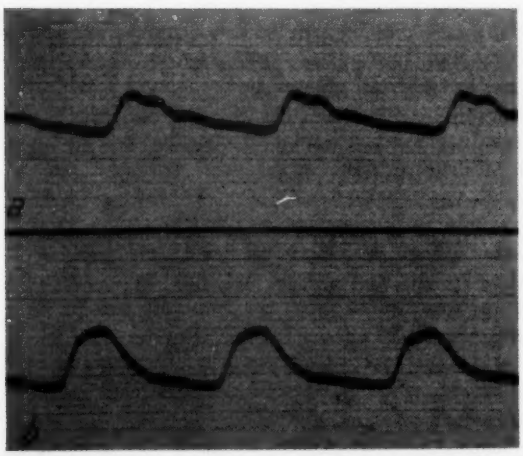
IV Tracing of a patient having reacted to the emotional test: (a) Regular pulse before the test. (b) extra-systoles in the course of the emotion. A phonoarteriogram (humeral) recorded simultaneously is annexed (above) to each of the tracings.

But as no one among us can escape interaction, what was then important was to be able to regulate it by determining the modality of these interactions and the law presiding over the totality of human activities. Already the clinical findings showed that:

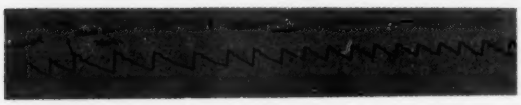
1. In a state of mental concentration, the vegetative system governs its own functions correctly.



V Modifications of the arterial wave under the influence of concentration, excluding all arrhythmia: (a) Before the concentration. (b) During the concentration: decrease in height of the pulsatile wave, which keeps the clearness of its contours. (Reaction of a hypertonic type).



VI Modification of the arterial wave under the influence of the emotion, excluding all arrhythmia: (a) Before the emotion. (b) During the emotional state: increase in the height of the pulsatile wave, which loses the clearness of its contours. (Reaction of a hypotonic type).



VII Instantaneous modifications of rhythm in both directions under the influence of will, with a normal subject.

2. In a state of emotional excitement it is subject to functional disturbances.

3. A conscious effort of thought at an appropriate level can control temporarily the subconscious functions and place them to a certain extent under the control of the will.

"Diffusion" is the passive state of consciousness which displays no effort to apply itself to a given object. This absence of direction gives free course to the play of associations of emotional or mental images succeeding each other mechanically. And one can see that in these conditions the notion of epiphenomenal consciousness naturally arises, since it simply witnesses the display of successive states, when, without obstacle, there unrolls that gamut of conditioned reflexes by which the whole psychic activity of man has been tentatively explained. The interference of the different levels (dark thoughts, violent emotions, psychological disorders) appear in a disastrous pathological aspect, each reinforcing the other in a series of vicious circles, while consciousness, perceiving these phenomena and complacently identifying itself with them, neglects to exercise its own positive authority which alone could be beneficent.

In the active state of "concentration," on the contrary, consciousness applies itself in full freedom and with clarity upon a subject or a chosen object, by mastering the energies of the different levels which it drains towards its center of interest. Ceasing to identify itself with organs which it now utilizes, and acting as a dynamic tensor, the master of the function which it organizes, it is free to exercise upon all the points on which it applies itself an objective judgment. Applied to a mental exercise, it annexes the emotion as a focus of interest directed to the study at hand. Applied to the emotion, it annexes knowledge to give it an artistic expression which embodies the mastered emotion. Even applied at the level of physiological phenomena, it seems to be able to intervene temporarily to allay or relieve normally automatic subconscious functions and place them once more under the control of conscious will. Thus one could say:

1. Wherever consciousness is concentrated, it is free in its expression and masters its means.

2. When it is occupied at higher levels, the rhythm in the lower physiological level follows automatically, as a ball suspended at the end of a thread tied to a higher point accomplishes a rhythmical and regular movement.

Such is the psychological concept to which we were brought by our first researches, conducted upon about fifty subjects.

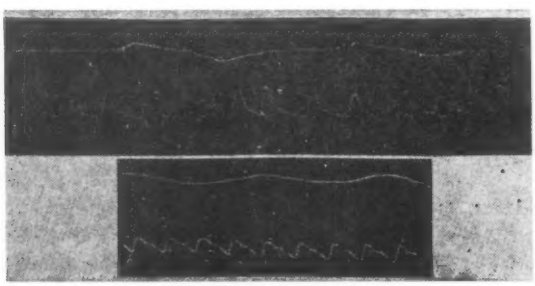
Yet our experiments were not pushed far enough to justify these general hypotheses fully. In fact, while the pulse signs proved to be easily modified in the course of our tests, the electrocardiogram expressing a more complex and profound biological phenomena did not appear, under the same conditions, susceptible of modifications,

sions of the artery; the same reaction is again recorded, but contralaterally, when the fatigue of a weight to be supported is imposed upon the segment of arm on the opposite side.

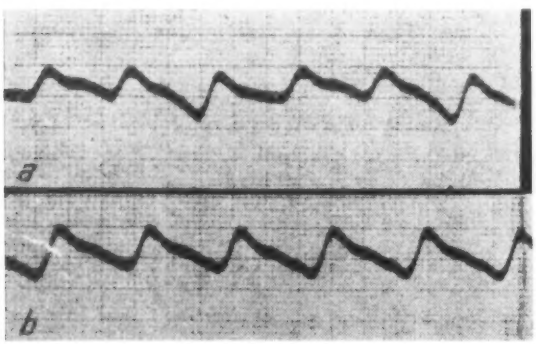
3. Finally, rare subjects could at will modify the rhythm of the pulse directly, either by slowing or acceleration.

The result of these experiments confirmed therefore that disturbed emotions cause physiological disorders and that, on the other hand, conscious control by the patient has a beneficient action on the autonomic system. From this it would seem to follow that one could re-educate the patient by asking him to live more constantly in this state of psychic discipline whose corollary is the regularization of the vegetative functions.

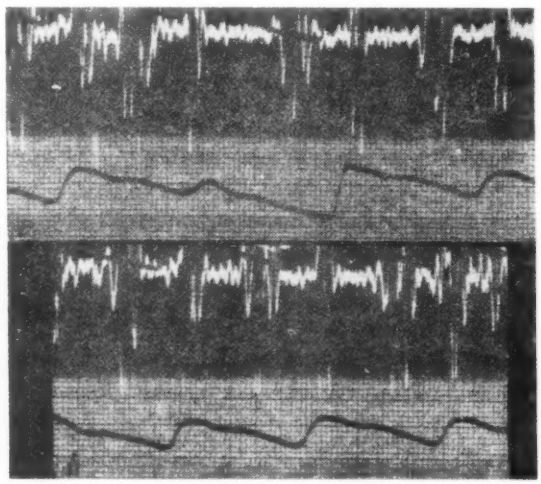
These clinical findings were not alone confirmed by experimental tests, but were also justified by what we know of the encephalon and its nervous channels, according to the most recent data of anatomy. It has been established that there exist in the brain three differentiated levels of psycho-physiological activities: the cortex area of intellection; the midbrain containing the centers of emotions, in close connection with the hypophysis (the glandular organ situated at the base of the cranium); the medullary zone, or lower center of automatic vegetative life. Upon the intercommunications of these different areas recent discoveries bring us most important documentation, due to the discovery of centers and fibers of the sympathetic system far beyond the lower stage and infiltrating in the zones from which it at first was believed to be completely independent. A number of sympathetic ganglia in the diencephalon explain the repercussions of emotions on physiological life, and fibers within the cortex account for the checking and regulating action of the cortex in vegetative phenomena. Thus the autonomic nervous system is not completely independent of the cerebro-spinal nervous system, but on the contrary, insures the interaction of all these zones of psycho-physiological activity which can be classified into a hierarchy, but cannot be isolated one from the other in the sum total of human life.



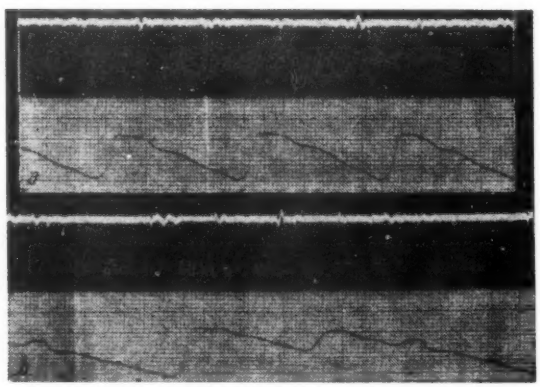
I Subject: 17 years old. The tracing represents the two curves, one above the other, of the pulse (below) and the breathing: (a) During a period of mental diffusion: respiratory arrhythmia. (b) During a period of concentration: regularization of the pulse.



II Modification of a sinusal anisophygmia (inequality of the pulse either in volume, time, or force in the symmetrical arteries of the body) under the influence of mental concentration: (a) During a period of mental diffusion (immediately before the test): irregularity. (b) During a period of concentration (during the test): regularization.



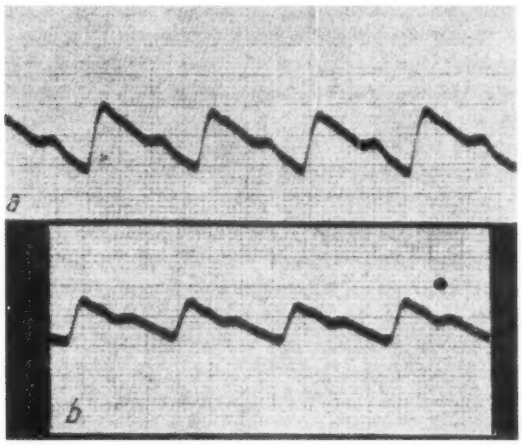
III (a) Extra-systoles during a period of mental diffusion. (b) Regularization during concentration. A phonocardiogram (graphic record of heart sound) recorded simultaneously is added above to each of the tracings.



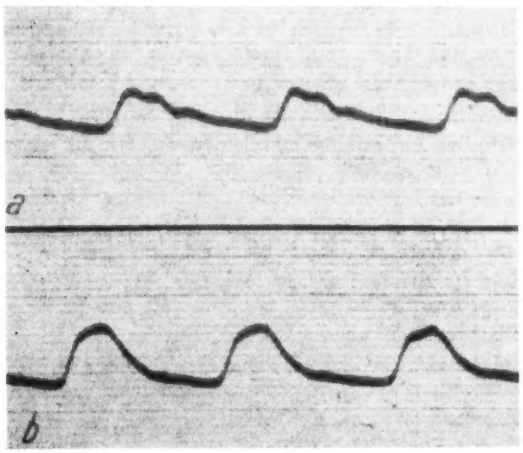
IV Tracing of a patient having reacted to the emotional test: (a) Regular pulse before the test. (b) extra-systoles in the course of the emotion. A phonoarteriogram (humeral) recorded simultaneously is annexed (above) to each of the tracings.

But as no one among us can escape interaction, what was then important was to be able to regulate it by determining the modality of these interactions and the law presiding over the totality of human activities. Already the clinical findings showed that:

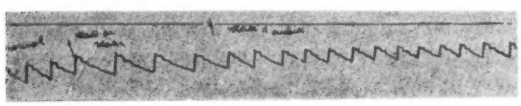
1. In a state of mental concentration, the vegetative system governs its own functions correctly.



V Modifications of the arterial wave under the influence of concentration, excluding all arrhythmia: (a) Before the concentration. (b) During the concentration: decrease in height of the pulsatile wave, which keeps the clearness of its contours. (Reaction of a hypertonic type).



VI Modification of the arterial wave under the influence of the emotion, excluding all arrhythmia: (a) Before the emotion. (b) During the emotional state: increase in the height of the pulsatile wave, which loses the clearness of its contours. (Reaction of a hypotonic type).



VII Instantaneous modifications of rhythm in both directions under the influence of will, with a normal subject.

2. In a state of emotional excitement it is subject to functional disturbances.

3. A conscious effort of thought at an appropriate level can control temporarily the subconscious functions and place them to a certain extent under the control of the will.

"Diffusion" is the passive state of consciousness which displays no effort to apply itself to a given object. This absence of direction gives free course to the play of associations of emotional or mental images succeeding each other mechanically. And one can see that in these conditions the notion of epiphenomenal consciousness naturally arises, since it simply witnesses the display of successive states, when, without obstacle, there unrolls that gamut of conditioned reflexes by which the whole psychic activity of man has been tentatively explained. The interference of the different levels (dark thoughts, violent emotions, psychological disorders) appear in a disastrous pathological aspect, each reinforcing the other in a series of vicious circles, while consciousness, perceiving these phenomena and complacently identifying itself with them, neglects to exercise its own positive authority which alone could be beneficent.

In the active state of "concentration," on the contrary, consciousness applies itself in full freedom and with clarity upon a subject or a chosen object, by mastering the energies of the different levels which it drains towards its center of interest. Ceasing to identify itself with organs which it now utilizes, and acting as a dynamic tensor, the master of the function which it organizes, it is free to exercise upon all the points on which it applies itself an objective judgment. Applied to a mental exercise, it annexes the emotion as a focus of interest directed to the study at hand. Applied to the emotion, it annexes knowledge to give it an artistic expression which embodies the mastered emotion. Even applied at the level of physiological phenomena, it seems to be able to intervene temporarily to allay or relieve normally automatic subconscious functions and place them once more under the control of conscious will. Thus one could say:

1. Wherever consciousness is concentrated, it is free in its expression and masters its means.

2. When it is occupied at higher levels, the rhythm in the lower physiological level follows automatically, as a ball suspended at the end of a thread tied to a higher point accomplishes a rhythmical and regular movement.

Such is the psychological concept to which we were brought by our first researches, conducted upon about fifty subjects.

Yet our experiments were not pushed far enough to justify these general hypotheses fully. In fact, while the pulse signs proved to be easily modified in the course of our tests, the electrocardiogram expressing a more complex and profound biological phenomena did not appear, under the same conditions, susceptible of modifications,

and the freedom of consciousness at the physiological level appeared to us insufficiently demonstrated.

Now, in the West there are no subjects specially trained for the intervention of will in organic functions which could permit us to record more important results. On the other hand, no teaching with us systematizes such a habit nor transmits such an education; no tradition frames it into a general law. In the Orient, on the contrary, and in India in particular, century-old schools of yoga strive to train their subjects in a physiological control unusual to us—and that precisely by exercises of concentration upon functional levels classified according to a traditional psychological structure. No system, therefore, could be more interesting to know and examine thoroughly, on the spot, in its theory and its results than this system of yoga. It was with this goal in mind that we undertook an expedition, hoping to confirm and extend the findings of previous researches.

The major difficulty, outside of the transportation of apparatus such as the electrocardiogram, consisted in the almost absolute impossibility of being able to enter into connections in India with authentic yogis and not with charlatans. In order to reduce to a minimum the probabilities of failure, I appealed to officials of the Theosophical Society, which at that time was holding a world convention at Madras, for assistance in contacting real Hindu society. When the Minister of Public Instruction in Paris saw the written promise of aid from this organization so close to the indigenous culture and philosophy of India, he was reassured and made it possible for me to undertake this mission and pursue my research work in India. Thus I gained the confidence of the Hindu authorities and the sympathy of the yogis. The fact that I knew some Sanskrit and was familiar with oriental psychology also helped in making these contacts. It is the tradition in Indian States, especially in the Hindu States of Mysore and Baroda, that the Maharajas have a concern in these matters, and it was the benevolent interest Their Highnesses showed in our work which made it possible to make numerous and successful recordings.* Later I was able to verify the wisdom of having chosen this method of approach, for in Benares I tried to contact a yogi, on my own, and this proved to be the only complete failure.

Before entering into the details of some of these recordings, it is necessary to clarify the subject, and to explain what yoga is from the point of view of the most eminent ascetics and psychologists of Hindu tradition. We expound their attitude in the following paragraphs.

Yoga is not, contrary to what is often believed in the West, either a philosophy or a religion (although it has religious inspiration), but a practical technique having as its goal the spiritual self-education of man. And while it is not intended for the cure of morbid states (this role belonging in traditional India to ayurvedic medicine), it includes an education in physical health indispensable as a basis of this discipline, and a training in voluntary mastership off functions habitually automatic. This does not depend in the Orient on any written treatise on psychology, just as one does not study anatomy in a treatise on gymnastics. But in the same way as a bodily motion always implies an organic structure, the spiritual exercise of yoga implies a psychological system whose organization it uses. This system is seen in the darsanas (insight) as a whole. It recognizes in man (who, in his pure essence, is spiritual energy itself) a series of levels in classified orders, physiological and psychological, which are forms through which he, who is life, is obliged to express himself, but with which levels he must not confuse himself. He must, on the contrary, master them by using them and, on the scale of these levels, progressively raise his consciousness to the end of realizing union with the transcendant. Yoga literally means union. In terms of yoga, *function* can be defined as the use made by life, that is to say, consciousness, of one of these levels where it concentrates itself. Moreover, let us say in passing that man is considered consubstantial with his natural milieu, and that a physical universe corresponds to the human body, a psychic universe to psychic man, and a spiritual universe to spiritual man. To master an inner human level is to acquire at the same time this mastery on the same world level, and yoga aims at the ultimate acquisition of a progressive and total mastery of all universal forces.

The specific exercise of yoga, the one which permits it to be reduced to a unique technique, whichever may be the secondary exercise, is "mental concentration" *(samyama)*. It is a concentration pushed beyond anything we can imagine, and divided into three periods:

In the first period *(dharana)*, the attention is fixed upon a chosen object (a body organ, a feeling, a philosophical concept, etc.). It is a struggle against automatic mechanisms which have a tendency to make it deviate by the involuntary presentation of other objects. It has to return upon this object and maintain itself upon it for a period of time determined by the will. It is the concentration of diffused attention and a focussing upon a single point. It is therefore the mastery of the essential function of the *I*: attention. The attention can have a different object at dif-

*The chief yogi who coöperated in the study is Sriman Krishnamacharya, who serves on the faculty of the Maharaja's Sanskrit College, Mysore, and is the author of a standard work on yoga, in the Kannada language. He and some of his pupils have also worked with Swami Kuvalayananda at the institution headed by the latter, at Lonavla, near Bombay. (This is the school of yoga wherein K. T. Behanan underwent discipline during his visit to India upon a Sterling Fellowship from Yale University.) His Highness, the Maharaja of Mysore, Sri Krishnarajendra Wadiyar Maharaja IV, maintains the traditions of his grandfather, the third in the Wadiyar dynasty, in supporting systematic studies and exercises in yoga, the Mysore Government having issued in 1885 the standard treatise, *Hatha Yoga Pradipika*. It is customary for a certain number of young men of aristocratic standing to be trained in the elements of the art at the Jaganmohan Palace, a special official (at present Sardar M. Gopal Raj Urs) being designated to supervise their studies along with Mr. Krishnamacharya. From these details the Western reader will realise that yoga is, at least in its simpler forms, a generally recognised part of indigenous culture in India.

ferent times, but the mechanism of its mastery remains identical. The elements making up this first period are therefore triple: subject, object, and act of concentration.

In the second period *(dhyana)* consciousness loses awareness of effort and the inhibition of the unconscious processes is complete. The *I* has only before it the chosen object upon which concentration, now happy and easy, can last indefinitely. There is now only the duality of subject-object, the feeling of effort has disappeared.

In the third period *(samadhi)* this feeling of duality of subject-object in turn disappears. The conscious being is indissolubly united to the object of its contemplation, melts into it and becomes identical with it.

These three periods constitute for the expert in this art a unique exercise. But the third is the most important; without it it is useless to speak of yoga. Yoga is *samadhi.*

One can see that in spite of this unique technique, there can exist several orders of yoga which are a function of the level used. The yoga exercised upon the psychological functions is raised in dignity above the art when exercised on the physiological functions, and is called royal yoga *(raja yoga),* subdivided into three categories: intelligence, feeling and active will. Physiological yoga, in which we are more particularly interested in its recordable results, can be only the initial stage of higher yoga. It has been called the yoga of effort *(hatha yoga).* For about the last fifty years it has become very common in India, and is about to spread also in the West, where the mystical aim general to yoga is neglected and the ambition is restricted to functional hygiene.

From these varieties of yoga reputedly flow an infinity of diverse powers, according to the object of concentration. These powers are, says the yogi, a function of the state of *samadhi* and inherent to it. Union in fact gives knowledge and knowledge confers power. For example, it is said that a yogi in absolute state of union with light would not be fully observable; with the power of sight he could create collective hallucinations; with sympathy tame ferocious beasts. In India there is no lack of wide-spread belief in matters of this kind. But, most often, these powers are of no interest to the true yogi, who has a repugnance for these demonstrations and pursues the elevation of his consciousness to the higher levels. The variable goal which can be aimed at by the yogis explains the divergence of opinions concerning them—divergences depending upon the levels at which they find satisfaction, upon the quality of the powers they obtain, and the use they make of them. And one can conceive the enormous difference separating a simple trickster and a holy personage, retired from the world and consulted from afar upon the most highly spiritual problems.

In order to cope with the exigencies of the experiments and the category of our instruments, we had to enter in contact with yogis giving physiological manifestations, particularly circulatory ones, and at the same time honest yogis, the single experience undertaken with an exploiter having proven, as said before, scientifically void of results. The difficulties of approach from the intellectual and religious sides were conquered by awakening in them a sympathy for our work and thereby inducing an active collaboration. Lending themselves to the annoyance inherent in our recordings with absolute calm and confidence, they even showed a touching gratitude for the interest given their effort. The *hatha* yogis whom we studied were sometimes professionals using their exercises for therapeutic ends, and teachers of physical culture in special schools. Sometimes they were amateurs practicing yoga only as the highest hygiene giving them a perfect physical and moral equilibrium. Finally, for some of them, *hatha* yoga was only a training for higher yoga, but these too lent themselves to our experiments with extreme good grace.

Outside of the yoga exercise itself, described at length as mental concentration, a certain number of preparatory conditions are demanded of the yogi. A special diet has been devised, in which all the portions are carefully balanced so as to create the least possible waste and eliminate, as far as possible, all toxic elements. The general hygiene also comprises self-imposed disciplines of silence, sometimes very prolonged; the regimen of psychic hygiene includes serenity, study, the absence of passions. Physical culture is practised under the form of postures which may appear to us as contortions but which, on the contrary, are calculated to insure a permanent action on a function while the attention is concentrated upon it; these postures are so varied that they develop harmoniously the whole body, which remains at the same time supple and strong.

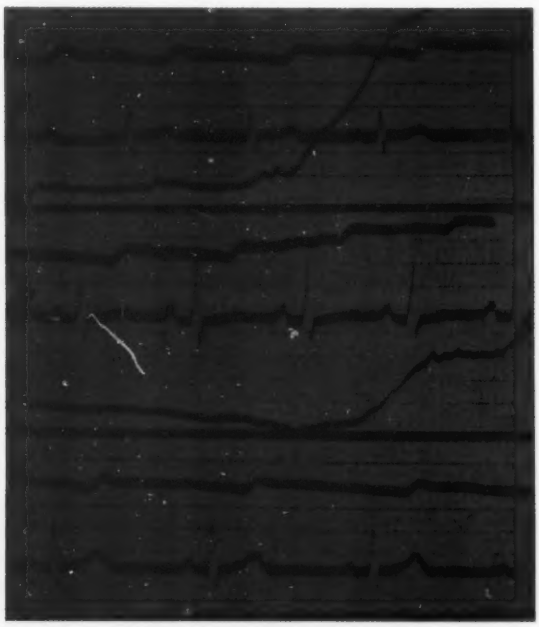
Finally, and above all, is the mastery of breathing, and through it, the yogis claim, mastery of vital energy *(prana).* This science of breath control *(pranayama)* is for them primary, and is the object of an extremely elaborate technique having for a basis apnoea, suspension of breath, either with full or empty lungs. This art is not simply an exercise performed on the material plane by the *hatha* yogi. Physical breathing, which binds us laterally to physical environment, is the symbol of another "breathing," spirit breathed out vertically, as it were, by the divine into matter and breathed in again towards it. This rhythm constitutes evolution. Thus physical *pranayama* is only the replica of spiritual *pranayama.* For the *raja* yogi, breathing out is to go out in the world, to act in it, and to conquer it; to breathe in is to have the certainty of being spirit; to hold one's breath is to affirm the union in oneself of conquering spirit and mastered matter. Higher *pranayama* is also mastery of breath, but here *prana* is divine breath, whose expression we are by its descent into matter, and it is for us to evolve that spiritual breath and thus return to the divine source.

The atmosphere is thus the vehicle of cosmic vitality which is, as in man, spiritual energy. The philosophy implies that there exists a lateral *prana* (vital air) as well as a vertical *prana* (spiritual creation). The ignorant man thinks that the psycho-spiritual air "breathed in" by the brain is

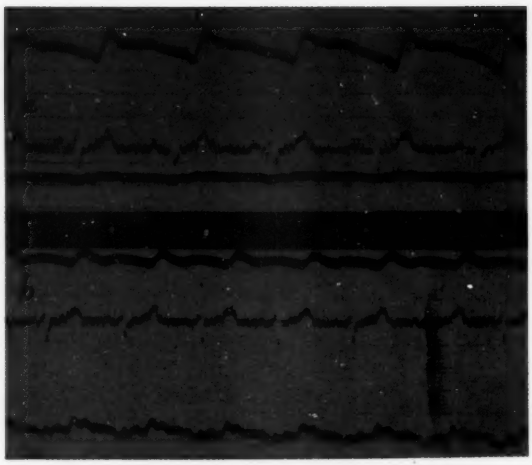
distinct from the air breathed in through the body. By uniting this double technique, one physiological and one of mental concentration, yoga reduces this duality to unity and makes concrete by experiment this truth that we are the divine life, one in man and in the universe.

The foregoing, in brief, is the Indian philosophy of the subject.

In the physiological domain, this mastery of breathing, considered as a preparatory yoga exercise by the yogi, is objective and can be definitely recorded. After years of training, phases of apnoea (suspension of breath) can last several hours: the longer the suspension of breathing, the greater the mastery of yoga. One of our yogis, as an experiment, had himself buried for ten hours under the observation of the medical corps of Baroda, who noted a tachycardia (rapid pulse) of 160, which quickly returned to normal. In the course of our examinations, the pneumograph registered repeatedly for ten to fifteen minutes these phases of apnoea so superficial that it was accompanied by no expansion of the thorax. By withdrawing what he calls vital energy, the yogi thus puts his body in a state of slowed-up life, comparable to that of hibernating animals. We were able to show this clearly through research of basic metabolism with the small Morisse apparatus. If the absolute figures should be erroneous under these difficult conditions, at least the comparative examinations before and after yoga exercises had some value, as the period of neutralization of an alkaline solution by the outbreathed carbonic acid was always longer by two or three minutes after the experiment.



VIII Modifications of the waves P and T of the electrocardiogram during the same exercise (Derivation [lead] II): (a) Flattening of P with low voltage, in the first period. (b) A minute later, accentuation of P, flattening of T and increase of the voltage for the rapid waves. (c) At the end of the exercise during the "control of the heart", normal aspect of the electrocardiogram.



IX (a) and (b) In the course of this exercise, during which the electrocardiogram shows a little general muscular tension, notice, on the one hand in the rapid waves the dimunition of R and the accentuation of S. On the other hand note the exaggeration of the shock of the apex on the line of the pneumograph which remains horizontal in apnoea. On (b) this exaggeration coincides with a considerable reduction of the arterial pulsatile wave.

Before we go on to describe the circulatory findings, which were the object of our graphic recordings, we may mention a few physiological feats witnessed by us. The mastery of the yogi over his voluntary muscular system is such as to permit already such difficult postures, for example, as a lateral displacement of the long straight muscles of the abdomen, contracted; the result is abdominal massage. But this elective mastery is also extended to the smooth fibers, regulating at will the peristaltic and antiperistaltic motions, permitting in both directions the play of the anal or vesical sphincters and insuring by simple suction and without the help of any other instrument the penetration of liquids in the bladder or the rectum.

Specifically, in our instrumental cardio-vascular examinations, we were able to record on the photosensitive paper of Boulitte's electrocardiograph 300 meters of film presenting three superposed curves: the arterial pulse, thanks to Pachon-Boulitte's capsule and Pachon's pneumatic cuff; the electrocardiogram; finally, the respiratory curve recorded by Marey's pneumograph. Moreover, the latter's diaphragm placed exactly on the region of the apex of the heart enabled us to read on this last curve the modalities of the shock of the apex.

Our recordings were made during yoga exercises, including simultaneously the respiratory exercises (particularly the long phases of apnoea) and mental concentration pushed to the degree of *samadhi*. Sometimes there were usual and progressive yoga exercises; at other times, upon

our request, there were special exercises which the yogis held would have specific influence upon circulation.

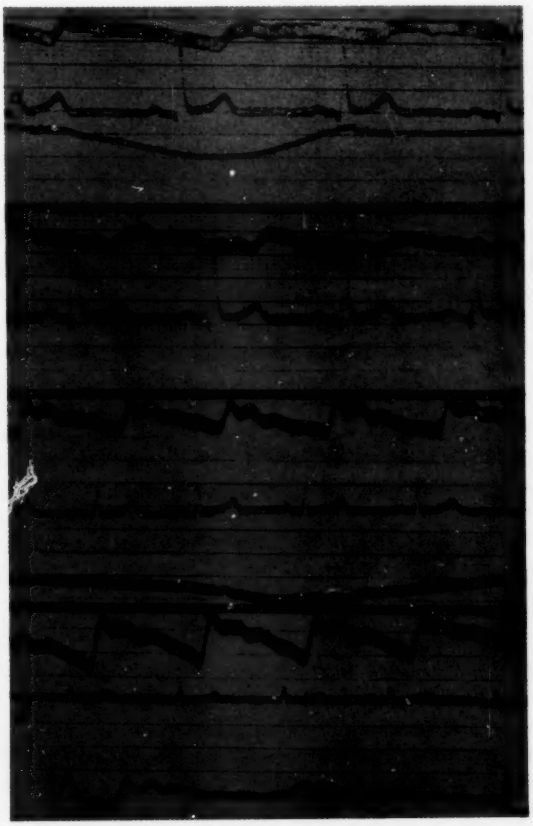
In the analysis of the results given by these tracings we will no longer refer to the modifications of the respiratory rhythm, which modifications show a prodigious accommodation to conditions of anoxemia (failure of the blood to oxygenate) which, in most of us, should cause asphyxiation. We will also mention, in passing, the changes of rhythm causing differences from 55 to 150 pulsations a minute, and the variations of amplitude and character of the pulse which reproduce on the graphs, the modifications already noted in the West but shown here in a much clearer way (fig. X, a, b). The modifications in the shock of the apex can also be seen (fig. IX, a, b), also certain paradoxical relations in the intensity of the different curves: arterial, cardiac, electric, in the course of the same exercise (fig. X, d; fig. XI, b). But the most important phenomena, precisely those we had justifiably come to India hoping to trace accurately, were shown by the electrocardiogram. By reason of the objectivity of the apparatus and the invariableness of consequence for a given exercise, the results are extremely curious and interesting. The modifications affect the different waves, auricular as well as ventricular, either in their very existence, or in their height, or in the reciprocal relations, and that at an interval of a few minutes or a few seconds on the same tracing. Several times in succession we checked the millivolt, so as not to make gross errors in our measurements. Thus follow, in succession on the same curve;

—Absence of P with complexes QRS and T normal;

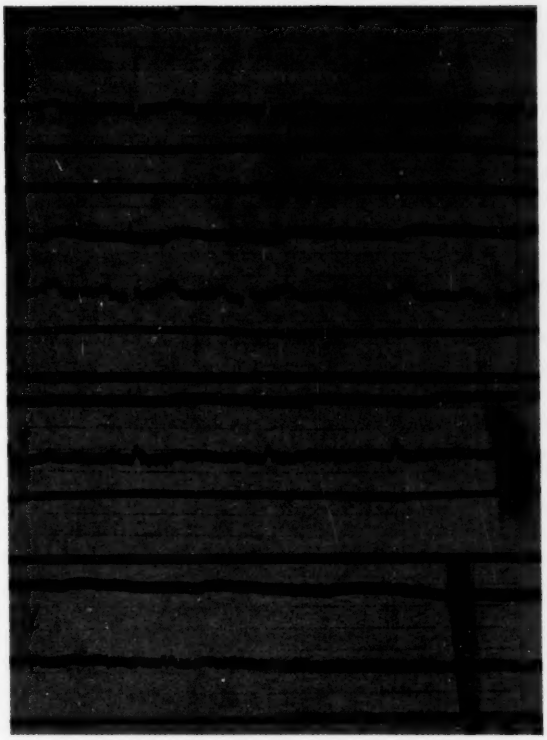
—Flattening of T with appearance of P;

—Finally, normal aspect of the three groups, when the yogi announces the control of the heart (fig. X).

In other cases the progressive suppression of R and the accentuation of S (fig. IX) in the course of the same derivation [lead] can be noted. More frequently it is a low generalized voltage (fig. X), d). In the most marked cases, after a phase of angling and widening of the ventricular complex, it ends by a flattening, then a disappearing of all the waves. The only thing that can be seen now on the isoelectric line is a tremor of lowest rank, the only trace of cardiac contraction, which it is almost impossible to detect (fig. XI, d). One would, upon seeing this curve, normally



X (a) and (b) Accentuation of the arterial waves under the influence of mental concentration (before and after). (c) and (d) With another subject, also clearness of detail of the pulsatile wave. On the other hand, low voltage during the exercise (d) coinciding with the increase of the height of the arterial pulsation.



XI (a) At the beginning of the exercise, normal electrocardiogram. (Derivation [lead] I.) Breathing extremely superficial. (b) A few seconds later: accentuation of all the waves of the electrocardiogram and of the image of the pulse. (c) Two minutes later: low voltage induced in all the waves. (d) Towards the tenth minute of the examination: still greater reduction of the voltage during total apnoea. At the end of the exercise, the image was again the same as on (a).

distinct from the air breathed in through the body. By uniting this double technique, one physiological and one of mental concentration, yoga reduces this duality to unity and makes concrete by experiment this truth that we are the divine life, one in man and in the universe.

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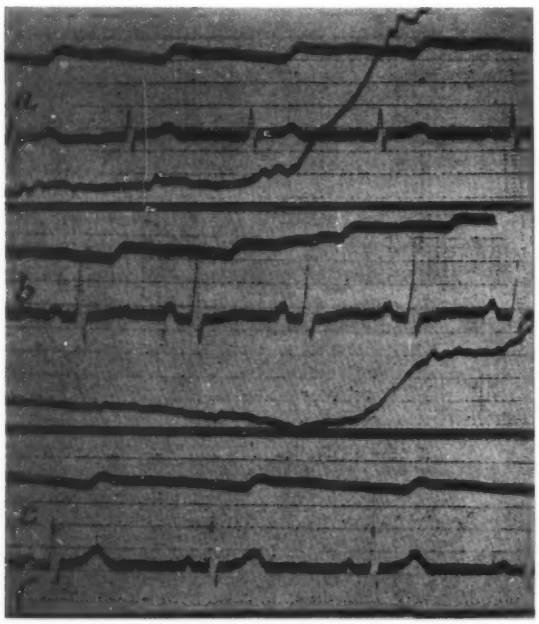

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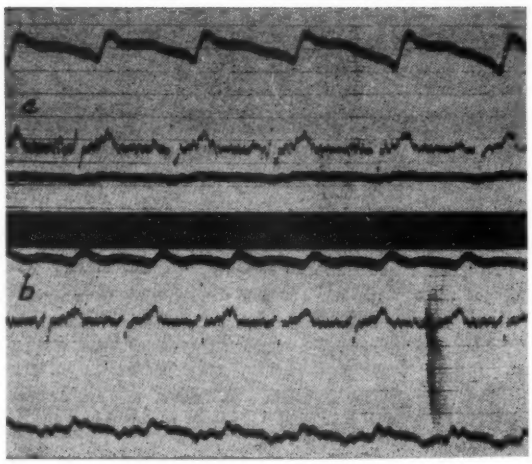


IX (a) and (b) In the course of this exercise, during which the electrocardiogram shows a little general muscular tension, notice, on the one hand in the rapid waves the dimunition of R and the accentuation of S. On the other hand note the exaggeration of the shock of the apex on the line of the pneumograph which remains horizontal in apnoea. On (b) this exaggeration coincides with a considerable reduction of the arterial pulsatile wave.

Before we go on to describe the circulatory findings, which were the object of our graphic recordings, we may mention a few physiological feats witnessed by us. The mastery of the yogi over his voluntary muscular system is such as to permit already such difficult postures, for example, as a lateral displacement of the long straight muscles of the abdomen, contracted; the result is abdominal massage. But this elective mastery is also extended to the smooth fibers, regulating at will the peristaltic and antiperistaltic motions, permitting in both directions the play of the anal or vesical sphincters and insuring by simple suction and without the help of any other instrument the penetration of liquids in the bladder or the rectum.

Specifically, in our instrumental cardio-vascular examinations, we were able to record on the photosensitive paper of Boulitte's electrocardiograph 300 meters of film presenting three superposed curves: the arterial pulse, thanks to Pachon-Boulitte's capsule and Pachon's pneumatic cuff; the electrocardiogram; finally, the respiratory curve recorded by Marey's pneumograph. Moreover, the latter's diaphragm placed exactly on the region of the apex of the heart enabled us to read on this last curve the modalities of the shock of the apex.

Our recordings were made during yoga exercises, including simultaneously the respiratory exercises (particularly the long phases of apnoea) and mental concentration pushed to the degree of *samadhi*. Sometimes there were usual and progressive yoga exercises; at other times, upon

our request, there were special exercises which the yogis held would have specific influence upon circulation.

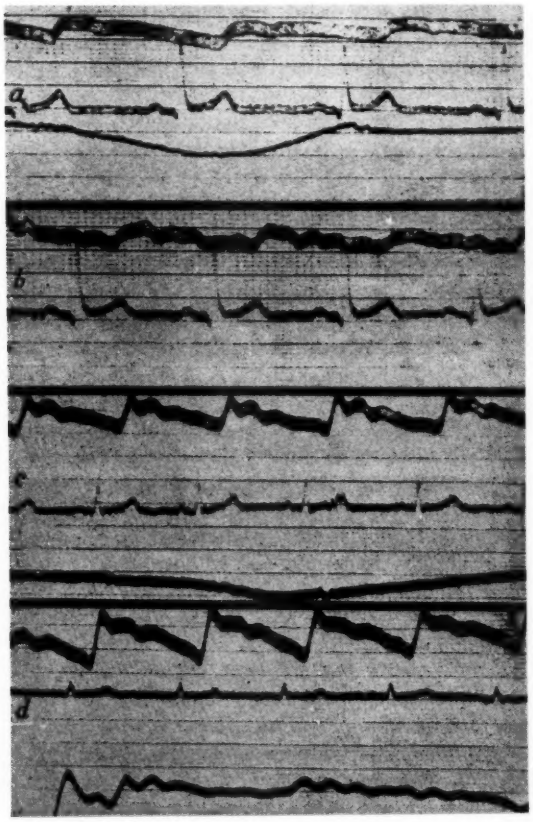
In the analysis of the results given by these tracings we will no longer refer to the modifications of the respiratory rhythm, which modifications show a prodigious accommodation to conditions of anoxemia (failure of the blood to oxygenate) which, in most of us, should cause asphyxiation. We will also mention, in passing, the changes of rhythm causing differences from 55 to 150 pulsations a minute, and the variations of amplitude and character of the pulse which reproduce on the graphs, the modifications already noted in the West but shown here in a much clearer way (fig. X, a, b). The modifications in the shock of the apex can also be seen (fig. IX, a, b), also certain paradoxical relations in the intensity of the different curves: arterial, cardiac, electric, in the course of the same exercise (fig. X, d; fig. XI, b). But the most important phenomena, precisely those we had justifiably come to India hoping to trace accurately, were shown by the electrocardiogram. By reason of the objectivity of the apparatus and the invariableness of consequence for a given exercise, the results are extremely curious and interesting. The modifications affect the different waves, auricular as well as ventricular, either in their very existence, or in their height, or in the reciprocal relations, and that at an interval of a few minutes or a few seconds on the same tracing. Several times in succession we checked the millivolt, so as not to make gross errors in our measurements. Thus follow, in succession on the same curve;

—Absence of P with complexes QRS and T normal;

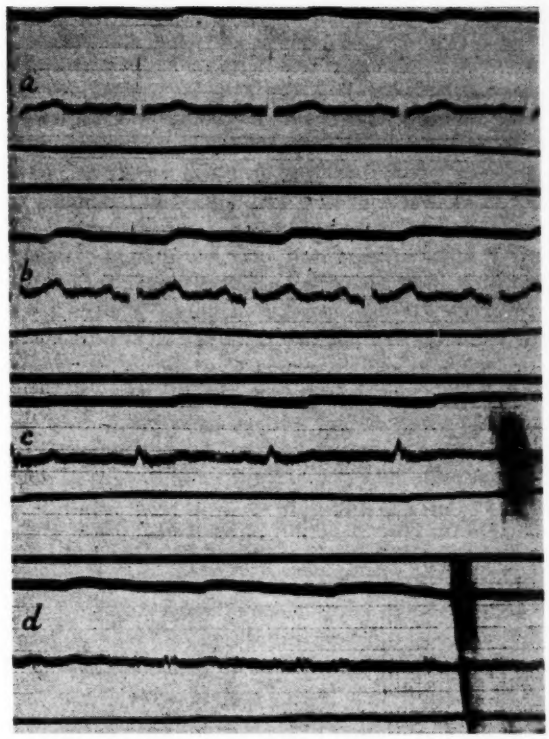
—Flattening of T with appearance of P;

—Finally, normal aspect of the three groups, when the yogi announces the control of the heart (fig. X).

In other cases the progressive suppression of R and the accentuation of S (fig. IX) in the course of the same derivation [lead] can be noted. More frequently it is a low generalized voltage (fig. X), d). In the most marked cases, after a phase of angling and widening of the ventricular complex, it ends by a flattening, then a disappearing of all the waves. The only thing that can be seen now on the isoelectric line is a tremor of lowest rank, the only trace of cardiac contraction, which it is almost impossible to detect (fig. XI, d). One would, upon seeing this curve, normally



X (a) and (b) Accentuation of the arterial waves under the influence of mental concentration (before and after). (c) and (d) With another subject, also clearness of detail of the pulsatile wave. On the other hand, low voltage during the exercise (d) coinciding with the increase of the height of the arterial pulsation.



XI (a) At the beginning of the exercise, normal electrocardiogram. (Derivation [lead] I.) Breathing extremely superficial. (b) A few seconds later: accentuation of all the waves of the electrocardiogram and of the image of the pulse. (c) Two minutes later: low voltage induced in all the waves. (d) Towards the tenth minute of the examination: still greater reduction of the voltage during total apnoea. At the end of the exercise, the image was again the same as on (a).

give a very severe prognosis, but in the preceding and following moments the electric silhouette was not only normal, but even exaggerated in its voltage, under the will of the yogi (fig. XI).

Before these facts it does not matter much whether our hypotheses attribute them either to an abnormal concentration of carbon dioxide in the blood, or to a change in the axis of the heart, or to a modification of the ionization of the tissues, or to these combined mechanisms or unsuspected other mechanisms, since the present state of our knowledge does not permit us as yet to take a stand. Whatever be the mechanism, what remains rightly dumbfounding is that the extreme fall of voltage takes place precisely when the yogi announces that he is going to withdraw the vital energy from his heart, and that the return to a normal or even an exaggerated voltage takes place when he declares that he controls the correct functioning of his heart. Now the yogi thinks of vital energy *(prana)* as electric energy. That is, he claims it to be of the same nature as lightning. On the other hand it is by the knowledge of a special science of breath that he can regulate vital energy. Recently much research has been done on the role of the lung in influencing the electric charge in the blood, the alveoli of the lungs drawing from the breathed-in air the negative ions which would give their charge to the colloids.

Thus we find these yogis are masters over divers human activities. Knowing nothing about the structure of their organs, they are however the incontestable masters of appropriate functions. Moreover, they enjoy a magnificent state of health which they could not keep if they continually violated the laws of physiological activity in the course of their extraordinary and prolonged exercises. And the results confirm the theory upon which these exercises are based.

Should these results not encourage us to pursue patiently these verifications in the vast experimental field at our disposal, by not hesitating to use such instruments, for example, as the encephalographs which could furnish a documentation of the highest interest in the field of concentration? Restricted as they may be, these experiments confirm for us the law we wanted to verify at the physiological level, namely the superior power of consciousness wherever it is concentrated. The modification of a biological phenomenon as complex and intimate as the electrocardiogram registers constitutes an important testimony.

On the other hand, these results, as well as the general study of yoga, allow us to confirm an idea of "function" in the sense in which we were able to conceive it before these verifications. When Westerners declare that "function creates the organ," our thought includes however many restrictions to this marvelous axiom, and we have a tendency to consider that function is simply the state of activity of living matter and that physiology depends on anatomy. On the contrary, when the science of yoga also states that "function transcends the organ," it builds upon this assertion a vast system of practical verifications and shows effectively the subordination of the organ to the function. And that should induce us to consider physiology more and more as the domain not of simple lateral interferences from organ to organ, but as a complex functional hierarchy also in the "vertical" sense (if one can say so), the psychic organism (emotional and mental) continually intervening to regulate or disrupt physiological life, according to the use put to it by conscious autonomy. It is the latter which gives a human character to the activity of psychophysiological levels in man. But if we give up conscious concentration and permit the loss of our autonomy on the psychic levels, the latter will, in turn, cause trouble to the physiological activity. The physiological function is bound to the psychic function and the latter is attached to the *I*. Man includes therefore indispensably a responsible conscious *I*, and general health requires necessarily its autonomy.

From the therapeutic point of view, it is not a question of sending our Western patients to pursue an extended self-mastery which is opposed to the very nature of European life. But these findings give us a direction suggested by our first investigations. When a physician undertakes and directs the cure of a functional syndrome, besides physical medication he can help to give confidence to his patient. But he could do more, and also show the way towards re-education by conscious control. Contemporary psychology has established by tests the relationship between consciousness and the psychological functional levels. It tends to orient education towards a culture of conscious autonomy nearer to the tradition of yoga than our traditional introspective psychology did, and also our total educational practice based on the latter.

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The original investigations, made in Paris, will be found reported (inter alia) *in* La Pratique Médicale Française, *February, 1937, in* Presse Medicale, *October 14, 1936, and (together with the studies done in India in 1935) in* Bulletin du Centre Homeopathique de France, *February, 1937. This is the first English translation.*

DAVID WHITE

Towards Education for Full Humanity

THE ULTIMATE GOAL OF EDUCATION IS A PERSON HIGHLY DEVELOPED
IN ONE OR MORE OF THOSE AREAS OF ACHIEVEMENT
KNOWN AS HEROIC ACTION, SELFLESS LOVE OR HUMANE WISDOM

ANY PHILOSOPHY OF EDUCATION normally attempts to answer at least three basic questions: What should be the goals of education? What kinds of experience will constitute effective means for the attainment of the desired goals? Upon what concepts and principles, facts and processes, do the answers to the first two questions depend?

Philosophy tends to concentrate, in Susanne Langer's apt phrase, upon "the clarification and articulation of concepts." Thus the necessary attention to "concepts and principles" in the third question, for upon them the validity and usefulness of the answers to the first two questions depend. But equal attention must be given to "facts and processes," because unless actual human experience is also taken into account, the theoretical elements of the philosophy are unlikely to be effective. We shall begin our examination with the first question, for until we understand clearly the kind of results we wish to attain, we will not be able to specify the means to be used.

I believe that the ultimate goal of education should be the attainment of "full humanity," a phrase which illustrates the necessity for clarification of concepts, since it denotes a goal which must be shown to be both desirable and attainable in actual human experience.

By "full humanity" I mean the highest, integrated development of the bio-physical, emotional, intellectual, and spiritual activity of which the individual human being is capable, such development being conceived as a continuing process.

Individuality is the essence of humanness. In the words of anthropologist Clifford Geertz, "If we want to discover what man amounts to, we can only find it in what men are: and what men are, above all other things, is various. It is in understanding that variousness—its range, its nature, its basis, and its implications—that we shall come to construct a concept of human nature that has both substance and truth."* This statement is true also if we want to discover what man may be, for what he is capable of becoming depends upon what he is.

But the human individual is not to be thought of as a static entity. Three of the terms in the thesis statement—"activity," "continuing," and "process"—emphasize that the integrated development of the person must be sought as a process which continues rather than culminates at some point in time. This conception of full humanity as a continuing, dynamic process in the experience of the individual person implies that there cannot be a single specification of what it means to be fully human.

The thesis statement also speaks of human activity as "biophysical, emotional, intellectual, and spiritual." These dynamic components of human experience are not to be thought of as mutually exclusive, but rather as interacting and even interdependent. The biophysical, affective and cognitive modes of human activity usually occur in a context of value and valuing, both individual and social, which is simply to say that people normally act, either deliberately or otherwise, in a context of purpose, trying to get and maintain the things and experiences they believe to be desirable. An important part of this conception of full humanity is the idea that the fully human individual this conception of reality will tend to integrate the three components of his experience in a way that contributes to wholeness, avoiding the conflicts that hinder personal development. So important is this aspect that the degree of integration of experience achieved is normally an excellent index of the individual's approach to full humanity.

But what of "spirit," the fourth element of human experience?

I think of reality as essentially a fourfold, dynamic continuum of matter, life, mind, and spirit. It includes much more than normally meets either the eye or the limited, rational mind that "more," which I call "spirit," is of su-

*"The Impact of the Concept of Culture on the Concept of Man," in J. R. Platt, ed., *New Views of the Nature of Man*, p. 115.

preme value in human experience, whether or not it be thought of in specifically religious terms. The inclusion of a transcendent-immanent spiritual consciousness within this conception of reality would justify its characterization as a "philosophical idealism" or even as a "mystical philosophy." But we need not pay much attention to such labels for however important the concept "Spirit" may be for this metaphysical position, it does not minimize the significance of matter, life and mind, the other elements of the reality-continuum.

Finally, the thesis statement speaks of full humanity as constituting the "highest" development of which the individual person is capable. The meaning of "highest" here depends upon the truth of certain presuppositions concerning the possibilities open to us. I assume, for example, that the potential for human development—both individual and social—is much greater than we usually believe it to be, or at any rate much greater than we seem to think when we set the goals of our actions. This assumption is grounded in the evidence and conclusions of many contemporary observers, such as Ashley Montagu, Roger W. Sperry, A. H. Maslow, John R. Platt, Jacob Bronowski, George Wald, and particularly Julian Huxley, whose conclusions concerning the human potential (especially in *Evolution in Action*) I have adapted to the purposes of this essay.

It is important to remember that human beings differ from other animals in a number of ways, several of which may be crucial. First, of course, is the fact that man possesses a massive forebrain which is highly coordinated with manual dexterity, including the ability to oppose fingers and thumb. He also possesses a self-consciousness which includes memory of his own individuality. He thinks and communicates by means of symbols, including language; he is the creator of symbolic systems such as religions, philosophies, technologies, and indeed, entire cultures and civilizations. Man has foresight, the unique ability to perceive alternatives of choice and action in a context of future possibilities. He is also capable of conceptualizing values; he conceives of things and experiences not immediately present to him, which he knows only in imagination, and he is then capable of setting out deliberately to attain them. He also conceptualizes problems and their possible solutions. Finally, he engages in intraspecific warfare, making use of his superiorities over other animals in the destruction of fellow human beings.

With the exception of his willingness to engage in warfare, these differences constitute a superiority which makes man thoroughly capable of further "psychosocial evolution," to use Huxley's apt phrase. Such evolution will not be biophysical, of course. But because of his symbolic thought and his well developed ways of communication, and because of his cultures and his technologies, man may yet evolve as a socio-cultural or ecological being, and, (though in this next instance "evolution" is not, strictly speaking, the proper term) the individual person may also develop toward that full humanity which is here our primary concern. Indeed, the likelihood of such a socio-cultural and ecological evolution will be greatly enhanced by an increase in the numbers of individuals who make a serious effort to become more fully human, since these are the individuals likely to work toward that wider social development which seems so necessary and desirable. Those who are concerned with education must think in these more immediate terms, since it is with individuals, not societies, that they must work.

A useful way of thinking about the nature of full humanity is to identify the qualities of character and the patterns of experience in the lives of those outstanding persons who have actually succeeded in becoming more fully human than most of mankind. Among the individuals who have developed their own capacities to a high degree, there tend to be three distinguishable (though not mutually exclusive) kinds, which represent emphases of character and activity rather than hard and fast categories of human personality.

We in the Western world have known these more fully human individuals as "heroes," "saints," and "sages." The hero is the man of action who has served his fellow men in various notable ways, always involving a sustained self-sacrifice. The saint is known for a selfless love of God and His creatures, usually expressed in acts of devoted service. The sage is the man of wisdom whose knowledge is effectively directed to the attainment and maintenance of human welfare. These individuals have all displayed what are clearly supernormal powers of action, of devotion, and of knowledge—some very exceptional persons, such as Jesus and Gautama Buddha, embodying all three categories of achievement. In terms of full humanity, they have actualized their individual human potential by means of singleness of purpose, self-discipline, and hard, sustained labor.

But besides their individual emphases on heroic action, selfless love, or beneficent knowledge, these developed men and women have also been extraordinarily full of energy and strength. Nothing seriously impaired their integrated wholeness of person and personality; in the language of the New Testament, these men and women had life, and they had it much more abundantly than is normally the case.

This is what I mean by full humanity as the ultimate goal of all education, for education as I conceive and work for it, both for myself and for my students, should be directed to the development of as many heroes, saints, and sages as possible. Such a goal demands the kind of educational activity and experience now to be examined.

Education is whatever a human being does, either deliberately or otherwise, which contributes to his development, individual or social, toward full humanity.

This initial proposition seems to be intended as a definitive statement about what constitutes education. A closer examination, however, reveals that it is at most a very general description of one kind of human activity, which includes both a hope and a directive, but certainly not a dogmatic definition. It is simply the briefest and the most inclusive statement I can make of the most basic single conclusion of all my years of thinking about the ends and means of education.

It must first be emphasized that "whatever a human being does, either deliberately or otherwise" is education only if the experiences involved contribute positively to his human development. Many acts and experiences by this definition constitute not education but "anti-education," since they actually contribute to the degradation of the person. Whether experiences contribute to the education of an individual depends upon his total condition at the time, as well as upon the character of the experience and the context in which it takes place. Examples of anti-education are, unfortunately, legion; they range all the way from various addictive experiences through the mediocrity of the ordinary classroom to the merely custodial efforts of the inner-city school.

The conception of education as the result of actions "either deliberate or otherwise" strongly implies that education is not restricted to our formal attempts to attain it; any act or experience may be a part of education. Fortunately for both students and educators, however, education as here conceived and formal education are by no means mutually exclusive. I have come to my somewhat unorthodox philosophy of education while participating as a teacher in "higher education," and I have actually experienced very little difficulty in practicing my educational principles as a professor in a liberal arts college of excellence, where "excellence" has all the usual academic implications.

Another important implication of this conception is that education, like the goal to which it is directed, is always a process, never a final or static condition of mind or person. The individual who is working toward full humanity never sees his own education as finished.

That the development of the person may be either "individual or social" indicates a necessary recognition of the social nature of human beings. This philosophy of education holds that all education is of the individual, but that the human individual exists only in a social context; this is true even of the individual who attempts to reject his society. It is consequently also true, on this view, that the education of the individual does not take place as it should unless there is in him a concurrent social development.

All education is ultimately self-education.

The basis for this statement is the obvious fact that, whatever else may be involved, it is the individual himself who must use his own experience for his own development—no one else can do it for him. This most fundamental fact of human experience has several significant corollaries.

In this view of education, there is almost no such thing as "teaching"; there is only "learning," and learning is so complex in nature that it bears only a superficial resemblance to those fact- or skilled-oriented activities which can be taught. Imitation, training and indoctrination are at most ancillary to that education which aims at the fullest possible development of the person. The reason for this somewhat radical attitude toward teaching is simply that the kind of individual development with which we are concerned can only result from a kind of learning which may or may not take place, however effective the teaching (in the usual sense of the term) may be.

However, the absoluteness of this generalization, "there is *almost* no such thing as teaching," must be qualified for two reasons: First, it is possible that some extraordinary individuals may actually be able to "teach" the kind of personal development that should be the goal of all education. Second, the art and science of teaching and of learning may one day reach a point of maturity such that their practice may become possible even for us less than extraordinary teachers.

If all education is essentially self-education, then the individual working toward full humanity cannot be directly dependent upon others for his own education, even though he is dependent upon his fellows and his society for his very existence. And though positive interpersonal relationships constitute a necessary condition for the full development of the human person, they are not in themselves sufficient for that development. The point of this insistence on the individual's independence is that what the individual himself does with his experience is crucial.

Regardless of the effectiveness of any formal or structured arrangements for his education, the individual is ultimately responsible for his own growth and development toward full humanity.

No one else can "educate" an individual. Yet we tend to blame others when we fail in our efforts to become educated, just as we sometimes mistakenly praise our teachers when we succeed. We must again distinguish between education at its best on the one hand and "formal education" on the other, since some societies discriminate against various groups in such a manner that many individuals are effectively prevented from getting even the indispensable minimum elements of a formal education. Another important pedagogical truism is that the teacher, at whatever level of education, must always encourage the student to assume specific responsibilities in his own learning situation.

Others, including "teachers," can and should facilitate the education of the individual.

Since the human person is a social being as well as an individual, interpersonal relations constitute a primary source of truly educational experience. An essential function of the teacher, for example, is to do everything he possibly can to facilitate the education of the individual; conversely, the student must do what he can to take advantage of this function of the teacher. This kind of interdependence on the part of student and teacher constitutes a fundamental social relationship. It must also be noted that other human beings may seriously hinder the education of the individual. This tragic fact is the case not only where formal education is misconceived or ineffectual; it is even more seriously the case where values, social patterns and the structure of society itself conspire to prevent individuals from working effectively toward their highest possible development.

Structured situations such as classrooms and laboratories may also facilitate the education of the individual.

In spite of the traditional truth of this proposition, structured situations are useful under two somewhat limiting conditions: when groups of students need to become familiar with a single body of facts or to learn a skill, and when a body of knowledge has been a significant part of cultural tradition long enough to have developed effective methods of presentation and assimilation. However, structured situations are often extremely ineffective when working at or near the present boundaries of human knowledge. We should not put too much emphasis on formal training and indoctrination, since the usual results of such methods are not likely to contribute significantly to our goal. Even the legitimate use of our formal educational experience is usually directed to that kind of learning which is largely ancillary to education for full humanity. Another way to put this is to say—as many perceptive students do—that a very large and important part of our true education takes place "outside the classroom."

Possibly the most potentially useful implication of this view of structured situations in education is that those of us who work on any level of "formal education" should employ a great deal more imagination and ingenuity in the structuring of our educational situations and experiences than we usually do.

Education takes place in a context of value and valuing.

Like all other human activities, education takes place in a multiplicity of contexts; however, the most fundamentally operative context is that of value and valuing. Much of human experience, especially that involving deliberate action, is explicitly or implicitly oriented around goals to be sought or goods (values) to be maintained.

Let us look briefly at "relevance," in terms of the questions which must be asked if the values involved are to be truly useful. Relevance to what? To success in one's vocation? In personal relationships? To life in the inner city? To human achievement? Even the most dearly held, not to say merely popular, values demand close scrutiny if they are to function as ends or means in the educational process. Or to put this more positively, our educational activities should be more directly and precisely referrable to values which may contribute to the final goal of full humanity, and it is one of the teacher's many responsibilities to see that such analysis and application take place.

Because education is basically value-oriented, the student usually works from a point of departure involving many kinds of preferences and aversions—activities that he enjoys, others he avoids, subject matter which interests him, subject matter for which he "couldn't care less," and so on. Such preferences and interests are normally very closely related to the student's motivation. At this point, therefore, the student and the teacher should be reciprocally involved: the teacher should do everything he can to interest and motivate the student; and—even more important—the student should come to realize that his initial interests and preferences are often very far indeed from being fully human.

The student certainly should build on his individual interests wherever they are relevant to his education; but he must control his aversions to the extent that he gives the teacher and the recommended educational activities a real opportunity to provide more significant motivation than that of initial likes and dislikes, which are often merely immediate or habitual responses to stimuli.

It is the responsibility of the teacher to maintain a careful analysis of the materials and activities which he presents to his students for their use. He should be continuously aware, for example, of the relation of what he does —and what he would have his students do—to the development of the individuals with whom he is working. One of the most important ways in which a teacher may facilitate the education of his students is to help them become aware of the values, present and potential, of particular activities, attitudes, and ideas in relation to their own development.

Educational activities may be oriented around ideas, attitudes, and acts; the most effective educational experiences tend to integrate these three elements of human behavior.

Ordinary human experience may be thought of as consisting generally of thought, feeling and action. The education of the developing individual should therefore attend to all of these fundamental components of experience. Formal educational activities may justifiably emphasize thought and cognition, but to be most effective, they must not neglect the emotional experience, the "attitudes,"

and the somatic activity of the student, including his physical health and vigor.

An important part of the experience of full humanity consists in an integration of total experience such that the individual suffers little or no *irreconcilable* conflict among its essential elements. The educated person is integrated in this respect at least to the extent that his thought, feeling, and action normally work actively together for his continuing development as a person. Conflict as such is probably not only normal; it may often be fruitful for further growth and development. The necessity is not to eliminate conflict but to resolve it usefully.

Some general principles important to this philosophy of education should be noticed.

Man's practical freedom is grounded in the fact that he is the most educable of all animals.

This statement deliberately begs the question of "freedom and determinism" in human experience. It merely posits "man's practical freedom"—that ordinary, actual, subjective experience of freedom of choice (within the recognized limits of normal experience) which is the usual presupposition of all our deliberate actions. We normally act, that is, as though we possessed sufficient freedom for most of our practical purposes. In the course of evolution, the animal we designate as *Homo sapiens* has developed the ability to perceive and to create alternatives in both thought and action to a much higher degree than have the other animals. This is the essence of what I have called our "practical freedom." If, therefore, what we often call "liberal education" is taken to mean that education tending to the liberation of the human person, then the encouragement of a disciplined awareness of alternatives is one of its most necessary elements.

Knowledge is the primary instrument of man's education.

Without specifying precisely what is meant by "knowledge," this statement is intended to emphasize the biological and anthropological fact that the human mind, however it may be defined, is both the cause and the effect of man's evolutionary development.

The developmental primacy of knowledge in human evolution means that cognitive activity, discipline and effort are both fundamental and crucial to the effective education of the human being. Those philosophies and programs of education which attempt to emphasize the importance of feeling and action in human experience *by minimizing the importance of thought and knowledge* are, therefore, extremely misguided, however tempting it may be, in a technological society like our own, to substitute "sincerity" or "authenticity" for a necessary knowledge of truth. The fact is that the development of the individual is not served by minimizing any of the three basic elements of human experience.

But crucially important as it is, the work of the intellect is nevertheless not to be conceived as self-contained, much less as totally self-sufficient. Knowledge "for its own sake" (if indeed there is such a thing in actual experience) is not directly relatable to human development, though it may conceivably contribute to the potential for such development. At some point in the process of education, knowledge must be integrated with both feeling and action. This kind of integration and wholeness of experience, however, is far from easy to achieve. It is at this point that the teacher can be helpful, even necessary, in the continuing education of the individual, since the teacher should have learned to perceive those "patterns of integration" which can be useful in the experience of his students.

Both rational and empirical methods are necessary for the attainment of knowledge.

Imagination, creativity, serendipity, intuition and empathy may contribute greatly to the discovery of truths, but it seems unlikely that such means can be central to the education of the individual unless they are firmly grounded in, integrated with, and disciplined by the more basic rational-empirical ways of getting knowledge.

Even if the contemporary emphasis on the primacy of empirical experience and induction is warranted, I hold that both rational and empirical methods for the attainment of knowledge are indispensable. Those philosophies and programs of education which emphasize the importance of "experience" by minimizing the importance of reason must once again be rejected; such efforts are not only misguided, they are actually inimical to the attainment of what might be called "the fullness of knowledge." If they are persisted in to the exclusion of other methods, they are simply fatal to the attainment of full development of the human individual.

In the process of education, as in human experience generally, the nature of the means employed determines the character of the ends attained.

This statement expresses what I believe to be a universal fact of human experience: We reap only what we sow; in the realm of human action, as elsewhere, "like begets like." That the character of the means employed determines the quality of the ends attained expresses the most fundamental ethical principle of this philosophy of education.

This conception of the absolute interdependence of means and ends is probably most important for the planning and implementation of concrete educational programs and activities, since its implications are almost inexhaustible. For example, you do not get individual integrity (much less autonomy) as a result of authoritarian attitudes and practices. Also, breadth of vision is not the result of exclusive specialization in higher education. I doubt, moreover, that an active curiosity is nor-

mally the result of passive listening to lectures from one who knows only the answers to his own questions.

The attitude most fundamental to education is that of the questioning mind.

The "questioning mind" is much more than a necessary openness to new truth; it is also an active willingness to question accepted truth, an active desire to seek new answers to old questions. This attitude underlies or reinforces other attitudes known to be important for the attainment of knowledge and the development of the individual: respect for truth whatever its source, "love of learning," simple curiosity, the willingness to postpone judgment, and so on. It is important to remember that attitudes, like ideas and acts, must be learned. The implication of this fact is that effective attention must be given to ways and means for developing a questioning mind both in teachers and students.

The most fundamental act of the student is his disciplined acceptance of responsibility for attaining his education.

The student's active, disciplined acceptance of responsibility for his own education is fundamental, because until this act takes place the student may all too easily remain the uncoordinated victim of his own idiosyncratic responses to random stimuli; when this is the case, as previously noted, the student is likely to confuse his own likes and dislikes with more universally human values.

The student may begin his acceptance of responsibility for his own education by critically examining his own values and goals in order to arrive at tentative conclusions concerning their present usefulness and future worth. He may then dsicipline himself more specifically to participate in the educational activities available to him, realizing that it is he himself who must ultimately make these experiences an actual part of his education. One of the primary functions of the effective teacher is to give encouragement and aid to these efforts, helping the student make and sustain this critical act of evaluation, while remembering always that the means will determine the ends.

The most fundamental function of the teacher is to facilitate, in every way possible, the education of the individuals with whom he works.

We noted earlier that it is nearly impossible to teach anyone anything directly pertinent to his development as a human being; the work of the teacher is primarily that of facilitating the actual education of the individual student. It seems appropriate, however, to summarize the legitimate and useful functions of the teacher for the benefit of his students.

The teacher will do everything he can to stimulate the asking of meaningful questions, as well as the sustained effort to arrive at significant, if tentative, answers. He will also do what he can to help make questions meaningful by analyzing and clarifying them whenever such analysis seems necessary or helpful, and he will often find it useful to provide facts and resources in the context of the questions students ask. He will encourage and assist the student's own critical analysis and evaluation of ideas, attitudes, acts and values in the context of the student's experience and needs. He will assist the student in the coordination and integration of his learning, wherever such assistance is possible. He will also assist the student in his evaluation of his own education as it takes place, so that the student may facilitate his own development toward the primary goal of full humanity. There are, of course many other functions which the conscientious teacher may serve in the education of his students, but in this view those outlined here are indispensable.

We may conclude this brief exploration of education for full humanity by emphasizing once again the central importance of the essential goal of such education in the life of the student:

The ultimate goal of education for full humanity is a highly developed and developing person who works effectively in one or more of those areas of human achievement known as heroic action, selfless love, and humane wisdom.

According to the anthropologist, Clifford Geertz, "Becoming human is becoming individual, and we become individual under the guidance of cultural patterns, historically created systems of meaning in terms of which we give form, order, point, and direction to our lives." (op. cit., p. 112 f.) In these terms, as well as in the terms of this philosophy of education, becoming *fully* human means becoming an individual who works with unique effectiveness in one or more of three ways: by engaging in action for the welfare of his fellow creatures, by manifesting a selflessly loving devotion to God and man, or by showing extraordinary acuity in the application of knowledge to human good. He will, in other words, be on his way to becoming a hero, a saint, or a sage.

Becoming human is becoming an individual, and becoming fully human is becoming an extraordinary individual; but we must not forget that we become individuals, as Geertz has said, "under the guidance of cultural patterns." Perhaps this philosophy of education will serve as one impetus for the creation of patterns to guide us in our efforts to attain our own full humanity, and to facilitate the education of others to that same end.

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RENÉE WEBER

The Good, The True, The Beautiful: Are They Attributes of the Universe?

DEDICATED TO FRITZ KUNZ, WHOSE LIFE WAS THE EMBODIMENT OF GOODNESS, TRUTH, AND BEAUTY.

ANCIENT INDIAN AND PLATONIC METAPHYSICS CONVERGE WITH CONTEMPORARY FIELD PHYSICS

. . . then, if we are not able to hunt the Good with one idea only, with three we may catch our prey: Beauty, Symmetry, Truth are the three . . .
— Plato, Philebus

The Law is the Truth and the Truth is the Law. The Truth and the Law are one.
— Brihadaranyaka Upanishad

To know that what is impenetrable to us really exists, manifesting itself as the highest wisdom and the most radiant beauty . . .
— Albert Einstein

THE AFFIRMATION OF GOODNESS, truth, and beauty as fundamental attributes of the universe is a legacy left to us by the sages of Greece and the seers of India. In its most coherent form, the doctrine has been traditionally identified with Plato, whose idealistic cosmology, metaphysics, and ethics have carried it down to us from the 4th century B. C. Far from being obsolete, Plato's triadic characterization of the cosmos is arousing renewed interest because, unexpectedly, contemporary science has arrived at some parallel conclusions.

For example, Harvard theoretical physicist Steven Weinberg expounds an essentially Platonic view in rejecting on a priori grounds the possibility that particle physics may violate the law of symmetry, which is itself aesthetic and derives from the idea of the beautiful: "'The answer . . . is that superficially some of these symmetries are broken and that nature, as we observe it, is but an imperfect representation of its own underlying laws.' He likens the concept to Plato's images on the cave walls (*Republic* VII), which were imperfect imitations of reality."[1] Indeed, the aesthetic requirements of elegance and simplicity are ultimately demanded of a valid physical theory, as Margenau has reiterated.[2] Nobel Laureate Richard P. Feynman, addressing himself to the problem whether, amidst diverse possible scientific theories, we can chose the one theory that is "right," replies: "Yes, we can recognize truth by its simplicity and by its beauty."[3]

These developments raise three central questions with which this paper will deal: (1) Is it legitimate to ascribe properties like "truth," "beauty," and "goodness" to nature as a whole? (2) Is there some *additional* feature of truth (absent in the scientific vision but present in that of sage and seer) that would suggest why 20th century science has not succeeded in *replacing* these ancient

claims (rather than displacing them to the edge of modern culture)? (3) Since science accepts the concept of truth and also that of beauty, can we, extrapolating from philosophical visions, predict that it will ultimately confirm the good as well? To explore these questions, we shall turn first to Plato, then to some parallel Eastern claims, and shall lastly probe the connections of these idealisms with 20th Century physics.

Idealism in its metaphysical (as contrasted with its ethical) sense embodies a claim about the fundamental structure of reality. Plato, the most influential Western metaphysical idealist, maintains that reality is unbroken, abstract and ideal, one non-material *Eidos* or Form underlying all that is. By contrast with, for example, the subjective idealism of Berkeley, the ideas are to Plato not mind-dependent, that is, they do not arise in some human mind; rather, they are eternal and independent of life, which continually arises and perishes, whereas Ideas, being uncompounded, are immutable.

To sharpen our conception of metaphysical idealism, we must ask ourselves: idealism versus—what? The answer, of course, is versus materialism, represented in the West by such figures as Lucretius, Bacon, Hobbes, Descartes (insofar as he propounded *res extensa*, his theory of matter), and Marx, and in the East by the 7th century B. C. Lokayata or Carvaka school in India. Metaphysical materialism holds the ultimate ground of the universe to be matter: an inert, opaque, self-sufficient,[4] billiard-ball ultimate unit extended in space, to which all entities can be reduced and by whose laws they can be explained. This view lies at the opposite extreme of Platonism, Indian Idealism, or indeed, of contemporary physics. The question arises, therefore, whether the philosophical terms "idealism" and "materialism" can validly be applied to other cognitive contexts such as science which, like metaphysics, make claims about reality. We shall argue that physics is the predominant 20th century idealism, and that, consequently, empirical as well as so-called "pure" conceptual systems can be "idealistic."

Plato, surveying in the 4th century B. C. the efforts of two hundred years of Greek philosophy, synthesized these around the single most important problem with which his predecessors had struggled: the problem of the one and the many, which involves questions of permanence, change, and motion. The existence of truth is for Plato the indubitable fundament on which philosophy rests. If truth did not exist, philosophy could not exist, for philosophy is based on knowledge, and without truth knowledge would be impossible, leaving only opinion or belief relative to each observer, incapable of dispute or adjudication. Seeming would be equivalent to being, surface appearance to profundity; no claim could be proven false and consequently none true—a position Plato exhibits as untenable in the *Theaetetus*.

Against this realm of becoming, characterized by cognitive and ethical relativism, Plato upholds the realm of Being as alone fully real. His criteria of reality are that it must be eternal, immutable, ultimate, hence nonmaterial, simple and uncompounded (like a point without dimensions), incapable of being pulled apart by time or any other force. Since nothing in the sensible realm meets these criteria, nothing in the sensible realm is real. This is not to ascribe an hallucinatory status to the phenomenal world; its entities possess a qualified reality insofar as they "copy" and consequently are muted likenesses of their source, the Forms or Ideas. This relationship has been most clearly set forth in the *Republic* (VI, VII), where the derivative and temporary nature of sense-objects is likened to that of puppets, "imitating" the genuine entities to which they owe their existence. They are useful catalysts that stir the soul into remembrance of their source, the ultimates which it once glimpsed whole and which they have the power to evoke *(Phaedo, Phaedrus)*. Pursued far enough (namely, to its very origins), any particular finite entity will lead us to its universal and infinite source *(Symposium)*.

The truth about the sensible world thus lies in the intelligible world; mere percepts and facts cannot yield knowledge, since they lack the informing principle that alone can *explain* (not merely *describe*) them. To explain is to illuminate the seemingly isolated particular in the light of the universal. This process involves cosmic principles, for Plato's universe is organic and organismic, a living entity endowed with intelligence and a soul, as he says in the *Timaeus*. In consequence, nothing exists in isolation: the particular truth and being of everything is indissolubly wedded to the truth and being of the whole. Such an insight is wrung from experience only by arduous effort and philosophical training. It demands de-emphasizing the world of perception which, by virtue of its unrelated randomness, is inimical to the synoptic vision of the truth.

"Let us say that the stable and pure and true and unalloyed has to do with the things which are eternal and unchangeable and unmixed. . . ." Thus, in *Philebus* (59), one of his last works, Plato circumscribes his notion of truth. As in earlier dialogues, he withholds an outright definition, restricting himself to symbolic or metaphorical allusions such as "true Being," or description by negation: "There abides the very being with which true knowledge is concerned: the colorless, formless, intangible essence, visible only to mind. . . ." (*Phaedrus* 247).

The failure to pin truth down discursively is intentional, and an integral part of Platonic doctrine. This silence (contrasting with Plato's customary explicit analyses in, for example, the critical dialogues) is meant to teach us that there are things which cannot be taught. We find him repeatedly stressing the experiential reality of his ultimate concepts. These cannot be conveyed in words, whose sole function is to inspire us to search on our own (*Phaedrus* 276).

The ineffability of ultimates applies above all to the sacrosanct Platonic concept, the One, regarding which Plato demonstrates that all predication leads to contra-

dictions (*Parmenides*). He therefore ends the dialogue with an ontological generalization: "Then we may sum up the argument in a word and say truly: if One is not, then nothing is." (166) Thus, the limitless One can be neither defined nor described. For these reasons, Plato in the *Republic* rejects even the most exact and exalted of all languages, mathematics, as insufficient to the region of Being, to which *dialectic* alone can lead us.

The stricture upon mathematics is striking, since in such works as *Meno, Phaedo, Republic,* and *Timaeus* Plato elevates it to the privileged human language. Yet even mathematics can be faulted on two counts: First, it utilizes diagrams and equations, both of which are rooted in the sensible world (lines, chalk, dimensions, etc.) and hence subject to distortion. Second and more significant, even mathematics employs unexamined definitions, axioms and hypotheses, which are assumed, but not known, to be true. By contrast, dialectic, "that other sort of knowledge," yields unmediated intuitive insight.

> [Dialectic] treats its assumptions not as first principles but as *hypotheses* in the literal sense, things "laid down" like a flight of steps [cf. *Symposium*] up which it may mount all the way to something that is not hypothetical, the first principle of all; and having grasped this, may turn back and . . . descend at last to a conclusion, never making use of any sensible object, but only of Forms, . . . (*Republic* 511)

If mathematics fails to explicate true being, all language will fail. Nevertheless, if being *could* be designated, Plato would do so in terms of goodness, truth and beauty. Lest the familiar moral, intellectual, or aesthetic overtones of those terms mislead us into anthropomorphic attributions, Plato wrenches them from their ordinary contexts. Beauty, accordingly, is not sensuous but abstract. It requires no social consensus for it is a cosmic concept connected on the one hand to truth, on the other to goodness. Preserving the Pythagorean vision of a mathematical universe, Plato links truth to order. Ratio, harmony, pattern and proportion underlie the universe, from the grain of dust to the galaxies: ". . . and God fashioned [the elements] by form and number . . . and [the body of the universe] was harmonized by proportion." (*Timaeus* 51-90). Lest this profound principle be mistaken as pragmatic, Plato distinguishes it from the mere mechanical counting or sorting that enable us to "manage" the world. Through mathematics, ". . . the power of the good has retired into the region of the beautiful, for measure and symmetry are beauty and virtue all the world over." (*Philebus* 64). Foreshadowing 20th century mathematical physics, Plato proclaims that "truth is akin to proportion." (*Republic* 486).

Beyond this, he makes a more sweeping claim: "truth" by itself, apart from beauty and goodness, is not truth but meaningless technology. Pursued without philosophy (love of wisdom), truth leaves us empty-handed (*Republic* 532). To reflect, for example, on the nature of numbers *per se*, ". . . is a thing . . . which I would . . . call useful: that is, if sought after with a view to the beautiful and good; but if pursued in any other spirit, useless." (*Republic* 531). Evidently, then, Platonic metaphysics cannot be grasped without the idea of the good. Although he repeatedly affirms that goodness and beauty are inseparable from each other and from truth (*Symposium, Lysis*), and though he specifies the criteria for beauty and truth rehearsed earlier in this paper, he offers none for the good. His most important concept thus remains elusive.

At best, Plato tells us how the good functions and what its absence would portend. It is clearly no mere human sentiment or expression of approbation or taste, but rather a force of nature. In the *Republic* (508) Plato characterizes the good as "that which imparts truth to the known and the power of knowing to the knower." As to the objects of knowledge, "these derive from the good . . . their very being and reality." Nonetheless, the good cannot be equated with being, for it exceeds it in "power," namely, as "the author of science and truth, and yet surpasses them in beauty." (*Republic* VI). Like the sun in our visible universe, the good gives being and life to all entities.

Discussing the nature of scientific explanation in the *Phaedo*, Plato attacks those who, like Anaxagoras, mistake description for explanation. What Anaxagoras (who used the concept of *nous*, mind, but assigned it a mechanistic function) forgot was "the binding power of the good," complains Plato. Without invoking this force of cosmic cohesion, we are left with pseudo-explanations instead of a genuine theory of nature. Plato's insistence on teleology remains alive even in one of his last works, the *Timaeus*.[5] Although the good is the author of being and thus set higher, the *Timaeus* in some sense equates the two, for the Demiurge "looked to what is best" in fashioning the universe. Value was therefore woven into the very fabric of creation, since the good furnished divine ideation with its model. The perfection of the good thus was translated into even so imperfect and refractory a medium as matter.

The account of the good leaves us with two dominant impressions: first, a sense of frustration that Plato's master-idea remains shrouded in mystery; second, a mounting certitude that the good is no mere metaphorical or mythical device, although Plato does at times so treat it. In numerous hints,[6] he holds out the possibility that we can experience the good directly, and the *Republic* may be construed as a methodological treatise towards that end.

> In the world of knowledge, the last thing to be seen and only with great difficulty, is the essential Form of the good. . . . Without having had a vision of this Form, no one can act with wisdom. . . . The soul . . . can learn by degrees to endure the sight of being, and of the brightest and best of being, or in other words, of the good. (*Republic* 517-518)

Such passages impart Plato's conviction that although being is saturated with good and the cosmos *perfect* in

Spinoza's sense, by its mere existence, we must guard against anthropomorphic connotations of these terms, for the path to the good is perilous for the unprepared. Hence he admonishes mankind to learn "to *endure*" the sight of being and "to *bear*" the vision of the good, "its reality and . . . supreme splendor." Such language rules out the possibility that the good refers to taste or pleasure, and urges the proposition that it is a cosmic force whose magnitude can overwhelm us, and which we must therefore approach "by degrees." Plato's position—cautioning aspirants against a too rapid approach to the good while simultaneously urging their ascent towards it—evokes other philosophies which share his attitude towards experiential union with the ultimate.

To students of Indian philosophy, the Platonic concepts of good, true, and beautiful find correlates in *sat* (being), *cit* (consciousness), and *ananda* (bliss). Let us note that like Plato, the Indian philosophers denied the possibility of predicating any properties whatever of the ultimate, exemplified in their phrase *neti, neti*: "not this, not that." Nevertheless, they provide some approximative attributes for Brahman, the immutable principle of reality: It is one rather than many, abstract and universal rather than concrete and particular; ideal and nonmaterial; eternal because uncompounded, i.e. "unborn"; infinite, not localized; hence field rather than finite thing; beyond words, thoughts, or concepts—"the one-without-a-second," as the Upanishads and later Shankara, propounding Advaita Vedanta, term it.

Brahman, not a god but a principle, corresponds to Plato's intelligible world, the source of being and the principle of life. As in Plato, knowledge thereof leads away from sense experience; after consciousness becomes commensurable with the object it seeks, it can know true being. "The subtle Self . . . is realized in that pure consciousness wherein is no duality [the mediative state]. . . ."[7]

Meditation,[8] we are told, transmutes the conditioned and partial into the unconditioned absolute. In Mahayana Buddhism, for example, the aim of meditation is to achieve the state of *sunyata*, emptiness, which is to say devoid of "self-nature" or delineable properties. It seems reasonable to conjecture that *meditation functions in Oriental philosophy as dialectic does in Plato*; both are direct, unmediated experiences of being that involve man's spiritual or higher consciousness. Just as dialectic is Plato's "coping stone of the sciences," surpassing even mathematics in its capacity to train us for "the contemplation of the highest of all realities" (*Republic* 533), so meditation is regarded as the unrivalled road to reality in Indian and Tibetan philosophy. Methodologically, these traditions view it as a form of empiricism, free from unexamined assumptions, and radical in the sense of reverting to the roots of experience. "Brahman can be apprehended only as knowledge that is one with reality, inseparable from it. For he is beyond all . . . instruments of thought . . . and arguments."[9] We shall examine this claim in greater detail, but first we must turn to a recurrent statement in the *Upanishads* that threatens the position we have been developing.

"In Brahman there is no diversity: he who sees diversity goes evermore from death to death."[10] This assertion rules out even predicates such as the good, the true, and the beautiful. So emphatically do the Vedantists and Madhyamika Buddhists stress the notion of the One, that an improper grasp of this truth entails man's imprisonment in the wheel of time. Epistemology is thus the gateway to salvation: freedom from enforced re-death.[11]

Despite this insistence on the One, however, Eastern thinkers (like their Greek counterparts Parmenides and Plato) were compelled to cope with the diversity and multiplicity of the perceived world. The problem of creation, the most stubborn in philosophy, is insoluble because it leads to the Antinomies of Reason, as Kant observed.[12] Yet it is an ever-present, nagging issue. "Why is there anything rather than nothing at all?": the question attributed to Anaximander of Miletus epitomizes the impotence of reason before the riddle of creation. Two qualified answers have been offered. Shankara, the most consistent of all non-dualists, expounds his "doctrine of superimposition," which argues that multiplicity is the illusory *figure* superimposed by the unenlightened consciousness upon the one veridical undifferentiated *ground*.[13] But Shankara's doctrine is so subtle as to baffle all but the few. Heinrich Zimmer offers a penetrating statement of the problem: the consciousness that asks for an answer to the question of creation exists within time, and therefore cannot understand the answer. For the enlightened consciousness, which alone could comprehend the answer, the question has disappeared.[14] To use Kantian terms, a phenomenal question in search of a noumenal answer is a self-evident paradox. Thus, despite some teleological allusions to the rationale of creation sketched in both Plato and Oriental philosophy,[15] the *why*, though asserted, remains unelaborated. We must content ourselves with the *how* of creation, with imaginative models such as the intuitive metaphor from the *Svetasvatara Upanishad:* "Like the butter hidden in cream is the Self which pervades all things."

The elegance and simplicity of this metaphor evoke the paradigms of the contemporary cosmologist, as do its monism and idealism. All diversity can be accounted for by means of one reality, transforming itself out of its own ground. The butter *is* the cream that has curdled itself into seemingly solid particles. Invoking Aristotle, the efficient cause (motion, or rather the geometry of space itself, as we shall shortly see) is a contracting or curving mechanism of the material cause, the cream, due to the formal cause, Brahman, the field, for the sake of a final cause that remains inscrutable to discursive thought. But if the final cause is obscure, the material and efficient causes of the cosmos are not.

Curiously, 20th century atomic physics is closer to the theories of Greek and Indian antiquity that it is to those of the intervening centuries. The physics of the 18th and 19th

centuries believed the universe to consist of tangible matter. But unlike the butter of our metaphor, the atomic material was seen as ultimate, causative, and extended "in" space—the ultimate impenetrable building blocks of all entities (Dalton), later conceived as a penetrable miniature solar system (Bohr-Rutherford) distinct from space, set into space, and different in kind from space itself.

Einstein's Theory of Relativity revolutionized that picture, moving us towards the monism and idealism of the Platonic-Vedantic traditions. It now appears possible that features of the cream-butter metaphor of matter can be mapped onto the current physical paradigm of creation.[16] Here we can offer only the barest outline, to furnish a framework for the questions sounded at the outset. The central of these is the status of truth, particularly that of physics, the frontier science that functions as our listening-post to the universe. The problem is two-fold: (1) What does this view relate to the theme we are pursuing?

The theories of contemporary physics cohere in many respects with the philosophical claims of Plato and the Vedantists. "Matter, in the old sense of something that occupies space, does not exist."[17] In its stead, we have a nonmaterial, vibrating continuum, a plenum of interpenetrating force fields, such as the gravitational, electromagnetic, strong and weak nuclear fields. Being nonmaterial, these force fields can be known only inferentially, by means of *test-objects* that reveal their presence, as a bar-magnet and iron filings, for instance, reveal the presence of the magnetic field. The conception of atoms as entities vibrating *in* space has been discredited, for there are no "atoms" *to* vibrate. Rather, space itself, which is universal, infinite, internally consistent and ultimately intelligible, is a supersensible field that is the source of everything in the universe, as F. L. Kunz points out.[18] When it thickens itself regionally, that is, when it localizes itself via its own geometries (resulting in this particular example in a curve or "deformation," as physicists term it), we have what we term "atoms," which are in fact "standing wave-systems in localized active fields."[19] As Pythagoras correctly foresaw, atoms are fundamentally harmonic: self-ordered waves that have slowed down. "What Planck determined was not a thing but an event: a little energy for a little while."[20]

This scientific cosmology, though known for over half a century, still startles us by its strangeness. Commenting on its unfamiliarity, Kunz predicted that "present data will look very different after we have habituated our minds to the fact that the force field potentials (noumena) are the reality"[21] rather than their transient and more obvious derivations known as matter. Once we grasp the meaning of the Einstein universe:

> What impresses our senses as matter is really a great concentration of energy compressed into a comparatively small space. We could regard matter as the regions of space where the field is extremely strong.[22]
>
> If matter approaches the speed of light, it is termed "energy," and conversely, if energy "congeals" it is seen as matter.[23]

And further emphasizing the priority of the field, Einstein asserts that "there would be no place, in our new physics, for both field and matter, field being the only reality."[24] The nature of the field is not yet entirely specified, and descriptions may vary. Henry Margenau, for example, argues that "[fields] all represent a continuous distribution of some quantity which needs to be further specified in each particular case."[25] Yet despite differences, physicists seem to agree that fields are primary, causal with respect to things, and enduring rather than ephemeral. Matter is the partial and temporary expression of the field, and this invisible and intelligible reality that is somehow linked with space.

With respect to the latter, Princeton astrophysicist John Wheeler believes space to be the basic ingredient of atoms, and speaks of the "incredibly energetic world of 'things,' each smaller than an electron by 20 powers of ten, each 'thing' composed of nothing but space itself, *pure fluctuating space* . . ., space that is changing, dynamic, altering from moment to moment."[26]

> There was a time when one looked for a building material to make molecules out of, and we discovered atoms. Then we looked for what atoms were built of and we discovered protons, neutrons, electrons. Today, if we look for the building material of electrons, we may be making an unnecessary search. We already have a building material: space itself. Of course, what space itself is built out of is the next question—a question we don't know how to answer.[27]

One possible answer is furnished by F. L. Kunz, namely that space itself is governed by the metric field, pure ideality devoid of energy or force.

> The forms and relations of living and non-living visible nature are determined by the given geometry of the physical universe, whatever that may ultimately prove to be. Thus a field is really a compound of its energy-potential characteristics, ***and of the metric***. . . .[28]

Wheeler's theory of *superspace* reaches even beyond Einstein:

> The stage on which the space of the universe moves is certainly not space itself. . . . The arena must be a larger object: *superspace* . . . [which] is not endowed with three or four dimensions [but] with an infinite number of dimensions. Any single point in superspace represents an entire, three-dimensional world.[29]

Earlier we asked how contemporary physics relates to the theme we have been pursuing. Wheeler makes the relationship explicit, for the infinity of space is the fundamental category in Hindu and Buddhist cosmology. Kunz notes that "***Parabrahman*** is the Indian word for the reality in which Atman occurs, in which it is lodged. ***Parabrahman***

is equivalent to space."[30] If Atman pervades space, it follows that space is neither empty nor inert.

However fantastic may seem the phenomenon of the pure "nothingness" of space seething with activity and creating "something" out of itself alone, Wheeler states that "anyone who accepts the quantum principle is *forced* to believe it."[31] Space in this sense is very like divine ideation in the *Timaeus*, even though Plato distributes the world's work among the receptacle (space), Demiurge (energy principle), and pattern (telos, the good). Similarly, space is the ontological key to Indian and Buddhist metaphysics, where it is termed *akasha* (from *kas*, to radiate or shine), and applies to both matter and consciousness, as Lama Govinda explains:

> In its grossest form *akasha* presents itself as matter; in its subtlest forms it merges imperceptibly into the realm of dynamic forces. . . . The nature of *akasha*, however, does not exhaust itself in this three-dimensionality. . . . It comprises *all* possibilities of movement, not only the physical, but also the spiritual ones: it comprises infinite dimensions. . . .[32]

Thus, the scientific doctrines sketched above bear a threefold connection to the metaphysical idealism we have been discussing. The mathematical theory of the universe, the ideal abstract metric field, and the primacy of space in field physics or geometrodynamics, link science with both Plato and Indian cosmology, where Brahman, the field, is conceived as the primal energy from which "all beings are born." (*Taittriya Upanishad*)

These systems stress the *ground*, namely the stability and continuity of the cosmic canvas. When we shift our perspectives to the *figure* that stands projected against the *ground*, we note a resemblance between quantum mechanics and Madhyamika and Tibetan Buddhism. Both dwell on the dynamism of the universe: its relentless self-renewal, a moment by moment creation and dissolution of even the most infinitesmal unit of being.

The foregoing urges the conclusion that scientific truth does not conflict but converges with the truth of metaphysical idealism; truth for both is not a mental construct but a property of the universe. Thus, when Weinberg was recently asked whether or not there is really something "out there" corresponding to the physicist's pointers and dials, he answered: "We make a compact with ourselves to *act* at least as if we believe that there's something out there, as if the things we're talking about have an objective reality."[33] This, however, might be construed as a merely updated version of William James' "will to believe," too fragile a construct to carry the Promethean weight assigned to it. To counter this fragility, we must look to a more radical empiricism, complementing that of science, that could furnish us with verification for these theories. The Indian concepts of *sat, cit,* and *ananda* may provide such a tradition.

Cit literally means awareness or consciousness, but we shall see that it connotes far more than this, for it functions both epistemologically and ontologically. Genuine knowledge in both Platonic and Indian philosophy is wisdom, i.e., a non-dualistic *state of Being* in which the knower, the known, and the process of knowing become one. *Cit*, while analagous to Plato's "truth," is more consistent about its thesis, a self-conscious cosmos—a notion that Plato makes explicit only in the *Timaeus*. The postulate that allows for this identity of knower and known rests on the equation of Brahman with Atman. Since matter is materialized energy (*prana*), it is a manifestation of the spiritual and eternal essence of "the real." Throughout our discussion, we have been emphasizing ontology: that the world is materialized Brahman. We must now turn to man's awareness of this truth, i.e., to the epistemological aspect of our Upanishadic metaphor.

> Like the butter hidden in cream, pure consciousness resides in every being. It is to be constantly churned, with the mind serving as the churning rod. . . . Knowledge of the Self is gained through meditation.[34]

This theory of consciousness encompasses cosmic creativity on the one hand (for Brahman precipitates itself as matter), human creativity on the other, when through the churning rod or tool known as "meditation" the illusory ego goes back into solution, reunited with the creative consciousness that is its source. Such a reversible equation recalls the Einsteinian equivalence of matter and energy, the particle and wave identity of quantum physics, and finally, Plato's dialectic. In the latter case, the ascent from the cave resolves multiplicity into ultimate unity; the descent reacknowledges the relative reality of the sensible world.

The idea of an alive, self-conscious universe is not altogether foreign to scientists such as Schrödinger, Wigner, and Margenau. Margenau, for example, refers to the "four-dimensional world-lines of physics, the representations of all events, in which neither past nor present nor future can be differentiated," as "well-infused with self-consciousness," and notes their affinity to the equivalence of Brahman and Atman.[35] Wigner and Schrödinger both grant that consciousness influences matter.[36] Moreover, Schrödinger, like Margenau, was struck by the Upanishadic equation of Brahman and Atman, a concept he considered "the quintessence of deepest insight into the happenings of the world."[37]

That having been said, the question remains whether the reality of sage and scientist can really be considered identical. The intentional object of both seems the same: discovery of what is ultimate, enunciated in the simplest terms. This entails a language that in each case is (1) highly technical (2) counter to common sense realism (3) abstract and admittedly approximative (4) supported by an elaborate infrastructure.

Atman, the eternal Self, is said to be "nearer than the nearest," yet at the same time "farther than the farthest"

and "subtler than the subtlest." In physics, to penetrate the postulated ultimate particle, the quark, of even a millimeter of matter, demands accelerators ranging from two to five miles. Only then can the particle acquire the requisite high energy that would manifest it to an observer. Analogously, the *experiential conviction* that Atman (oneself) and Brahman (the world) are *already* one is impossible without traversing meditational metaspaces vaster than the spaces traversed by high energy particles about their magnetic rings. An identical law seems to govern both phenomena: only at infinitely higher energy levels than those at which matter and consciousness customarily vibrate is their true nature revealed. This seems a strange state of affairs, challenging our differentiation of subjective and objective knowledge. Yet Wheeler, confronting equally alien frameworks in his work on black holes, finds "strangeness" no contraindication of truth. "We will first understand how simple the universe is when we recognize how strange it is."[38]

An inference can be drawn that truth, properly grasped, appears to human consciousness as beauty, so that it suffuses us with joy. Plato's equation of truth and beauty is echoed in *ananda*, i.e., bliss, joy, beatitude, which is associated with the liberated consciousness that knows itself to be divine (*moksha*). *Sat*, the Sanskrit term for being or "the actual," functions like Plato's good. (To denote their inseparability, *satcitananda* often occurs as one word in the literature.)

The second question we originally posed was: "What does science lack that has deprived it of its full pre-eminence in our culture as bearer of truth?" We suggest that the answer lies in the too rigid restriction of the boundaries of science—its unexamined assumption, for example, that "the good" lies beyond its domain of inquiry in a separate "subjective" realm called "value." This apparent rejection denies the intrinsic ontological reality of the good, and thus renders science cold, neutral, and dehumanized. Severed from goodness and beauty—its supreme principles and *meaning*—truth becomes weightless, incapable of claiming man's inspiration, allegiance, or even his interest. The result is a sense of unconnectedness to the truths science exhibits. It could, of course, be argued that Plato's concept of truth and the Indian *cit* can equally be faulted as purely impersonal universal principles. But they are firmly united with beauty and goodness, on the one hand, and with *ananda* and *sat* on the other.

The concept of a universal "all" transcends its status as classificatory truth through the experience of beauty and bliss, becoming thereby a living force that pulls man "in" through *integration, not reduction.* The indifference and unresponsiveness to truth unadorned—which are so apparent in our society—become irrelevant before beauty, and inconceivable when the good or *sat* is experienced as a living reality, for to experience the good is to undergo a change in consciousness.

Goodness, truth, and beauty, consequently, are not properties of the universe in the Cartesian or Lockean sense. They are modalities in which the universe is experienced when apprehended *in depth* by an awakened consciousness. This depth-consciousness is functionally stratified according to a septenary system detailed in classical Indian philosophy. As we proceed from the level of immediate sense perception to mental constructs and generalizations, and thence to an intuitive apprehension of wholeness, the quantified world of discrete entities begins to take on aesthetic form. In Sanskrit terminology, what *manas* (the mind) comprehends as truth, *buddhi* (the intuition) recognizes as beauty, and *atman* (the highest spiritual consciousness) apprehends in a unitive vision as the good.[39]

Science is beginning to acknowledge that truth and beauty have an intrinsic relationship. Einstein's sense of awe before the simplicity of the mathematical laws that govern the universe is legendary:

> Can we ever hope to find the right way [to truth]? Nay, more, has this right way any existence outside our illusions? . . . I answer without hesitation that . . . our experience hitherto justifies us in believing that nature is the realisation of the simplest conceivable mathematical ideas.[40]

Feynman affirms and, if anything, strengthens this view: "To those who do not know mathematics, it is difficult to get across a real feeling as to the beauty, the deepest beauty, of nature."[41] Pondering the problem of prediction and extrapolation, one of the distinctive features of science, he writes: "What is it about nature that lets this happen, that it is possible to guess from one part what the rest is going to do? . . . I think it is because nature has a simplicity and therefore a great beauty."[42] Such statements underline the fact that beauty is not extraneous to the scientific method, but an indispensable element in evaluating competing theories. Beauty has thus *acquired predictive power,* and become an intrinsic part of science, guiding it towards truth.

That brings us to our last question. Given that science accepts beauty and truth as criteria of reality, what does it say about the good? As yet, very little. Feynman does hazard a cryptic speculation that "the next great era of awakening of human intellect may well produce a method of understanding the *qualitative* content of equations . . .,"[43] but it is difficult to envision the form that scientific verifications of the value dimension might take. Still, such speculation points the way which an open-minded curiosity may initiate.

Science, after all, is not a "thing." To reify it rigidly is Whitehead's "fallacy of misplaced concreteness." In this century, particularly, scientists seem aware of the tentative and symbolic fabric of their formulations. Intrinsically, reality is neither the formulae of science nor the metaphors of metaphysics. Reality *is.*

"To find nature herself, all her forms must be shattered." Meister Eckhart's dictum captures the direction both of

20th century physics and of the ancient metaphysics which we have been exploring. These latter appear to have moved with ease for some thousands of years through a terrain that is novel to science, and hence they are at home with ideas like "creative emptiness," (*sunyata*) or the "radiance" of the unformed. The quantitative splendor becomes qualitative, we have suggested, when apprehended through dialectic or meditation, which are means towards "shattering" nature's forms.

Hence our final question: since science has granted two out of the three attributes we have been probing as fundamental to the universe, can we expect it some day to come up with the third of these, the good?

Our answer, at best conjectural, is that a supplementary methodology to the current scientific one, namely the radical empiricism adverted to earlier, can lead the scientist qua human being to determine—using himself as the test-object—whether or not this third attribute exists. Such experimentation would be of great scientific interest. If this experienceable "radiance," the good, which according to Plato is so powerful that it "makes truth possible," ever becomes part of the domain of scientific discourse (as beauty and elegance already have), we may anticipate a revolution in thought, a new paradigm in Kuhn's sense.

That paradigm would re-draw the map of being. If truth, goodness, and beauty are one, fact and value become one. The schism between the inner and the outer, which since Hume and Kant has bequeathed us a schizoid and fragmented world, could then be healed.

Notes and References

[1] Address to the Optical Society of America, *N.Y. Times*, April 29, 1974, p. 21.

[2] Henry Margenau, *Open Vistas* (New Haven: Yale Univ. Press), 1961.

[3] Richard P. Feynman, *The Character of Physical Law* (Cambridge: M.I.T. Press), 1967, p. 171.

[4] Since Cartesian matter requires God's creation and sustenance, its self-sufficiency is qualified.

[5] Whether or not Plato "changed" his Theory of Forms depends on the dating of the *Timaeus;* see R. E. Allen, ed., *Studies in Plato's Metaphysics* (London: Routledge & Kegan Paul), 1965, pp. 317-369.

[6] *Symposium, Phaedo, Republic, Phaedrus, Philebus.*

[7] *The Upanishads*, tr. Prabhavananda and Manchester (N. Y.: New American Lib.), 1957, p. 47.

[8] "Meditation," a rigorous discipline aiming for spiritual self-transformation, must be distinguished from current fads which have more limited and superficial goals.

[9] *Brihadaranyaka*, in *The Upanishads*, p. 110.

[10] *Ibid.*

[11] "Enforced" because the enlightened Buddhist Bodhisattva *choses* whether or not to incarnate.

[12] Kant demonstrates that pure Reason, disconnected from experience, cannot adjudicate the contradictory metaphysical inferences it can draw with equal validity.

[13] Shankara, *Crest Jewel of Discrimination*, tr. Prabhavananda and Isherwood (New York: New Am. Lib.), 1970.

[14] Heinrich Zimmer, *Philosophies of India*, Bollingen Series XVI (Princeton Univ. Press), 1969.

[15] Plato says the divine mind desired "that all things should come as near as possible to himself." *(Timaeus);* Hinduism's *lila* is cosmic, creative playfulness.

[16] The works of Margenau, Heisenberg, von Weizsäcker, Capek, Bohm, Wheeler, Kunz, Tiller, for example. Also Henry Margenau ed., *Integrative Principles of Modern Thought* (N. Y.: Gordon & Breach), 1972; *Main Currents*, 1-32.

[17] F. L. Kunz, "The Reality of the Non-Material," *Main Currents in Modern Thought*, 20, 2, 33-40.

[18] *Ibid.*

[19] *Ibid.*

[20] *Ibid.*

[21] *Ibid.*

[22] Einstein and Infeld, *The Evolution of Physics* (New York: Simon and Schuster), 1938, pp. 256-258.

[23] Einstein quoted in Ruth Renya, *The Philosophy of Matter in the Atomic Era* (New York: Asia Publ. House), 1962, p. 50.

[24] Einstein and Infeld, *op. cit.*, pp. 256-258.

[25] Henry Margenau, "Fields in Physics and Biology," *Main Currents in Modern Thought*, 15, 3, p. 61.

[26] John Archibald Wheeler, in *University: A Princeton Quarterly*, 53, Summer 1973, p. 29.

[27] *Ibid.*, p. 30.

[28] F. L. Kunz, *op. cit.*, p. 37.

[29] Wheeler, *op. cit.*, p. 29.

[30] F. L. Kunz, Mimeographed lecture notes.

[31] Wheeler, *op. cit.*, pp. 30-31.

[32] Lama Anagarika Govinda, *Foundations of Tibetan Mysticism* (New York: Samuel Weiser), 1972, pp. 116-130.

[33] Steven Weinberg, "Quarks," *Nova Series:* "Elementary Particle Physics," Educational Television Network, November 23, 1974.

[34] *Amritabindu* and *Svetasvatara Upanishads.*

[35] Margenau, personal communication to the author.

[36] Eugene Wigner, quoted in Arthur Koestler, *The Challenge of Chance* (New York: Random House), 1974.

[37] Erwin Schrödinger, *What is Life* (Cambridge Univ. Press), 1969, p. 93.

[38] Wheeler, "The Black Hole and Beyond," Lecture delivered at Princeton University, November 7, 1974.

[39] The septenary system widens Cartesian dualism into seven irreducible domains, ranging from the physical through the atmic, differentiated by their vibratory states. Even Buddhism, whose doctrine of anatta (non-existence of a permanent soul) might be expected to rule out such states or "vehicles," nevertheless presents their counterparts in the *Dharmakaya* or body of truth, the *Samboghakaya*, the body of bliss radiance, and the *Nirmanakaya*, the body "of the 4th dimension . . . integrating the dimension of individual corporeal experience with . . . [that] of the infinity of the *Dharmakaya* and the spiritual creativeness and rapture of the *Samboghakaya*." Govinda, *op. cit.*, p. 22.

[40] Einstein, quoted in Yang, *Elementary Particle Physics* (Princeton Univ. Press), 1962, p. 65.

[41] Feynman, *The Character of Physical Law*, p. 58.

[42] *Ibid.*, p. 173.

[43] Feynman, *The Feynman Lectures on Physics*, Vol. II (Palo Alto: Addison Wesley), 1964.

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Society

Three Basic Trends of Our Times

PITIRIM A. SOROKIN

THE FACTORS WHICH ARE CREATING A NEW WORLD CULTURE

THE THREE GREATEST TRENDS of our time are: *first*, a shift of the creative leadership of mankind from Europe and the West, where it has been centered for the last five centuries, to a wider area of the Pacific and the Atlantic, particularly the Americas, Asia and Africa; *second*, a continued disintegration of the hitherto dominant Sensate man, culture, society and system of values; *third*, the emergence and slow growth of the first components of a new, Integral, dominant order, system of values, and type of personality.

The Shift of Creative Leadership

We all know that creative leadership, both on a small and a large scale, shifts in the course of time from place to place, group to group, country to country. Thus, in the days of W. James, J. Royce, Pierce, Palmer and Munsterberg, the Harvard department of philosophy certainly led all others in American universities. With the passing of these men, Harvard lost this role and the leadership moved elsewhere. The same thing applies to other kinds of leadership. Some seventy years ago New England was the center of the textile and other industries in the United States. Later on the center moved to other regions of the country. On a larger scale, in the period from 800 to 1600 Italy produced 25 to 41 percent of European scientific discoveries and inventions; in the period since 1726 its share has dwindled to from 2 to 4 percent. The United States contributed only 1.1 percent of the total inventions in the period of 1726-1750; this share increased to 25.3 percent from 1900 to 1908, and it is now still greater.

History tells us that at one time the center of political power was in Egypt; at others it shifted, now to Babylon or Persia, now to India or China, now to Rome or Europe, and within Europe it continued to shift from nation to nation. Likewise, the great centers of musical creativity in Europe were at one period in Sparta, then in Rome and Milan, then in Italy and France, the Netherlands and England, Austria and Germany, and finally, in Russia, Norway, Finland and the United States. For the last ten centuries, Western economic power was centered in Spain, Portugal and Italy, then in the Netherlands, France, England, Austria, Germany, and now in the United States and Russia.

We all know that up to the fourteenth century, roughly, the creative leadership of mankind centered in the peoples and nations of Asia and Africa. While the West was still very primitive, the great civilizations in Africa and Asia—the Egyptian, the Babylonic, the Iranic, the Sumerian, the Hittite, the Hindu, the Chinese, the Mediterranean and others—emerged and fluctuated in growth and decline for millenia.

The Western or Euro-American peoples were the last to assume the creative leadership. During the last five or six centuries they discharged their creative mission brilliantly, especially in the fields of science, technology, Sensate fine arts, politics and economics. At the present time, however, the European monopoly of leadership can be considered about ended. The history of mankind will be increasingly staged on the larger scene of the Asiatic-African-American-European theater. The epochal shift is already under way. It has manifested itself in the dissolution of the great European empires, in the decreasing political and cultural influence of Europe, and in the shift of creativity of several European nations to other continents—the Anglo-Saxon to the United States, Canada and Australia; the Spanish and Portuguese to Latin America; in the Soviet Union, the growth of Asiatic Russia. A still stronger manifestation of this shift is the unquestionable renaissance of the great cultures of Asia and Africa, which has shown itself in the growth of their political and social independence and of their influence in international affairs, in their rapid scientific and technological development, and in the diffusion of their religious, philosophical, ethical, artistic and cultural values in the Western world.

All these and a legion of other evidence make the fact of the shift of the creative leadership of mankind away from Europe fairly certain. It is pregnant with momentous changes in all cultures and in the social life of all nations. Its effects upon the future history of man are going to be incomparably great. Such is the first basic sociocultural trend of the last few decades.

Sensate Ideational and Integral Sociocultural Orders

The other two trends—a continued decay of the Sensate sociocultural system of the West, and the emergence of a new Integral order—are possibly of still more importance for mankind. In order to unfold the meaning of these statements I must make a short explanation.

Some thirty years ago I ventured upon a detailed diagnosis of the state of Western culture and made many a forecast of war, revolution and human misery. Summarized, this diagnosis ran as follows:

"Every important aspect of the life, organization and culture of Western society is in an extraordinary crisis. . . . We are seemingly between two epochs: the dying Sensate [secular] culture of our magnificant yesterday and the coming [new] culture of the creative tomorrow. We are living, thinking and acting at the end of a brilliant six-hundred-year-long Sensate day. The oblique rays of the sun still illumine the glory of the passing epoch. But the light is fading, and in the deepening shadows it becomes more and more difficult to see clearly and to orient ourselves safely in the confusions of the twilight. The night of the transitory period begins to loom before us, with its nightmares, frightening shadows and heart-rending horrors. Beyond it, however, the dawn of a new great culture is probably waiting to greet the men of the future."

Despite inimical criticism of this diagnosis by the gaudily optimistic 1920's, it turned out to be correct. So far history has supported my prognosis.

Since the transitional state of the present Euro-American culture largely determines its essential features, it is advisable to outline more precisely the nature of the present crisis. The main points are as follows:

It consists in a disintegration of the Sensate form of our culture, society and way of life, which has been dominant in the Western world during the last five centuries. The crisis involves all departments of Sensate culture and society. In this sense it is total, epochal and global.

Sensate Culture

The Sensate form of culture and society is based upon the ultimate principle that true reality and value are *sensory*, and that there is no other reality and no real values beyond those that we can see, hear, touch, taste and smell.

The whole system of Sensate culture represents mainly an articulation and "materialization" of this ultimate principle in its science and philosophy, its religion, its law and ethics, its economics and politics, its fine arts and social institutions. This basic principle becomes also the main determinant of the values, aspirations and way of life of Sensate society. Consistent with this principle, Sensate culture makes the testimony of our senses the criterion of what is true and false. It cultivates scientific knowledge of the physical and biological properties of sensory reality intensively, and it is uncreative in the field of supersensory religion and theology.

Again, Sensate society is successful in technological invention aimed at increasing bodily comfort, but it is less successful in producing supersensory values. It favors the development of materialist, empiricist, positivist and other sensory philosophies, and it disfavors the cultivation of idealistic, mystical and metaphysical systems of philosophy. Despite lip-service to spiritual values, it stresses the sensory values of wealth, health, comfort, pleasure, power and fame. Its dominant ethic is invariably utilitarian and hedonistic. It views all ethical and legal precepts as man-made conventions, perfectly relative and changeable. Its politics and economics are also decisively utilitarian and hedonistic. And as we shall see, its fine arts are marked by similar characteristics.

Sensate form emerged in Western culture at the end of the twelfth century; it subsequently grew and, after the fifteenth century, became dominant, supplanting the preceding religious or Ideational form which dominated the mediaeval period of Western culture from about the seventh to the thirteenth century.

Ideational Culture

The Ideational culture and society of the Middle Ages were based upon the ultimate principle that the true reality and value are the super-sensory and super-rational God and His Kingdom, as they are defined in the Christian Credo, while sensory reality and values are either false or sinful. Consistent with this principle, this culture believes in God's revelations as the criterion of truth, and disbelieves the testimony of the senses. Accordingly, Ideational culture cares little about scientific study of sensory phenomena or technological invention; since the sensory world is a mere mirage, it is a waste of time to investigate what is only the shadow of reality.

For this reason, Ideational culture is uncreative in the field of science and technology. In contrast, it concentrates its cognitive energy on a study of the Kingdom of God and a realization of its values. St. Augustine's *"Deum et animum scire cupio. Nihilne plus? Nihil ommino."* (I want to know God and soul. Nothing more? Absolutely nothing.) admirably expresses this property of Ideational culture. For this reason it is creative in the field of religion; theology becomes the queen of sciences and science only the handmaid of religion. Similarly, idealistic, mystical and supersensory philosophies flourish, while materialistic, mechanistic, empiricist, positivist and other such philosophies have no success. This kind of culture views material and sensory values as sin and temptation; its verities and its ethical and legal precepts are regarded as God's revealed commandments, universal and unconditional in their truth and binding power. Its government is conspicuously theocratic, and spiritual authority has supremacy over secular power.

Finally, Sensate and Ideational cultures have entirely different types of fine arts, each created in accordance with the ultimate principle of the culture.

In accordance with its cultural principles, the topic of Ideational art is the supersensory Kingdom of God. It is religious art through and through. It pays little attention to the sensory world. Its object is not to entertain or give pleasure, but to bring the believer into a closer union with God. As such an art, it is sacred and does not admit any sensualism, satire, comedy, caricature, or anything extraneous to its nature. Its emotional tone is pious, ethereal and ascetic.

Its dominant style is symbolic. It is a visible or audible sign of the invisible or supersensory world of values. Since God and reality do not have specific material form, they cannot be perceived or depicted naturalistically; they can only be denoted symbolically. Immersed in an eternal transcendental world, Ideational art is static, hieratic, externally simple, even archaic. Being an art of the communion of the human soul with its God and itself, it does not need professional mediator-artists and is the creation of the anonymous collectivity of believers.

We all know that the supreme examples of mediaeval architecture are the great cathedrals. Their external form—cruciform foundation, dome or spire, and architectural details—are symbolic. Mediaeval sculpture, in turn, is entirely religious, and represents the Bible frozen in stone or wood. Mediaeval painting is a pictorial representation of religious doctrines; it is almost entirely symbolic and otherworldly. The same thing is true of mediaeval literature, music, and drama; all were created, as Theophilus said, "not for the love of human praising, neither for temporary profitable cupidity, but for augmenting the honor and glory of the name of God." In brief, mediaeval art was a truly great Ideational art.

In accordance with the ultimate principle of Sensate culture, on the other hand, its art moves entirely in the empirical world of the senses. Landscapes, genre, objects, events and adventures, and sensory values are its topics. The aim of Sensate art is to afford a refined sensual enjoyment, stimulation, and entertainment. For this reason it is sensational, passionate, pathetic, sensuous and incessantly new. In its overripe phases, it is divorced from religion, morality, science, philosophy and other values, and calls itself "art for art's sake." It widely uses caricature, satire, comedy and farce.

Its style is naturalistic, visual, free from symbolism. It reproduces empirical phenomena realistically. It is dynamic in its very nature; it changes incessantly in a succession of fashions, because otherwise it becomes boring. It stands and falls by its appearance, like a glamor girl; to retain its charm, it makes lavish use of aids to beauty, stunning new techniques and clever and arresting innovations. It is an art of professional artists catering to a passive public, and, at its overripe stage, to the demands of the commercial market.

Integral Culture

Once in a while a third basic type of culture and fine arts, intermediary between the Sensate and the Ideational, emerges for a comparatively short time. Its ultimate principle proclaims that the true reality-value is an Infinite Manifold which has supersensory, rational and sensory forms inseparable from one another. This type of culture can be called *Integral.* It includes the empirical as well as the superempirical aspects of reality, science as well as philosophy and theology. Its fine arts are partly supersensory and partly empirical, but only in the noblest aspects of sensory reality. It is an art intentionally blind to everything vulgar, debasing and ugly in the empirical world of the senses. Its style is partly symbolic and allegoric, partly realistic and naturalistic. Its emotional tone is serene, calm and imperturbable. The artist here is merely *primus inter parea* of the community of which he is a member.

Each of these three types of culture has been realized several times throughout history: among pre-literate tribes, in ancient Egypt, Babylon, Iran, China, Greece and Rome, and in the Western world. In the life-history of Greco-Roman-Western culture and art, the dominant form from the ninth to the sixth century B.C. was Ideational; from the second half of the sixth to the end of the fourth century B.C. it was predominantly Integral; during subsequent centuries it became preeminently Sensate; after the third century A.D. it disintegrated into a mixture of different types until this eclecticism was replaced, after the sixth century by the Christian Ideational culture and fine art, which maintained its domination up to the end of the twelfth century.

At the end of the twelfth century this Ideational art and culture began to disintegrate and a new Sensate culture emerged and started to grow. In the thirteenth century these two currents met and produced the marvelous European Integral art of the thirteenth and fourteenth centuries. At the end of the fifteenth century the Sensate type of culture and most of the European fine arts (except music, whose Integral character maintained its slight domination almost to the nineteenth century) became dominant and so continued until the end of the nineteenth century. During this period Sensate culture achieved unprecedented progress in science, technology, economics and politics, and created a vast treasury of magnificent masterpieces of Sensate music, painting, sculpture, literature and drama. However, at the end of the nineteenth century the culture began to show the symptons of creative fatigue and disintegration.

The Explosion of War and Crime as a Result of the Disintegration of Sensate Order

In the twentieth century, the magnificent Sensate house of Western man began to deteriorate. Its crumbling means, among other things, disintegration of its moral, legal, and other values which from within control and guide behavior of individuals and groups. When human beings cease to be controlled by deeply interiorized religious, ethical, aesthetic

and other values, they become the victims of force and fraud as controlling factors of their relationships and destiny. In such conditions, man turns into a human animal driven mainly by his biological urges and passions. Unrestricted egotism (individual and collective) flares up, the competitive struggle for existence intensifies, and war, revolution, crime and other forms of interhuman strife explode on an unprecedented scale. So it was in all great transitory periods from one basic sociocultural order to another in the past, and so it has been in the present century, which has been the bloodiest of all the twenty-five centuries of Greco-Roman and Western history.

Engendered by the disintegration of Sensate order, these wars and crimes have in their turn greatly hastened this disintegration. It continues at the present time, and makes this process one of the three basic trends of our age. Fortunately for those societies which manage to survive, the disintegration process often generates the emergence and mobilization of the forces opposed to it. Weak and insignificant at the beginning, these forces slowly grow and begin not only to combat the disintegration but to build a new sociocultural order which can meet more adequately the challenge of the critical transition and the post-transitory future. This emergent process is slowly developing now. It makes the third basic trend of our time.

The epochal struggle between the progressively sterile and destructive forces of the dying Sensate order and the creative forces of the emerging, Integral sociocultural order marks all of today's cultural and social life, and deeply affects the ways of life of all of us.

The Epochal Struggle in Science

In science this double process has manifested itself on the one hand, first, in an increasing destructiveness of morally irresponsible, Sensate scientific achievements like nuclear warfare, and second, in an increasing number of scientists who refuse to cooperate in this misuse of scientific creativity. The result has been the growth of scientific organizations like the Society for Social Responsibility in Science, and the beginning of a transformation of the basic theories of science in a morally responsible, Integral direction.

This change has already made today's science less materialistic, mechanistic and deterministic—or less Sensate—than it was during the preceding two centuries. Matter has become but a condensed form of energy which dematerializes into radiation. The material atom is already dissolved into more than thirty non-material "cryptic, arcane, perplexing, enigmatic and inscrutable" elementary particles: electron and anti-electron, proton and anti-proton, photon, mesons, etc., or into the "image" of waves which turn into waves of probability, waves of consciousness which our thought projects afar. These, like those associated with the propagation of light quanta, need no substratum in order to propagate in space-time; they undulate neither in fluid, nor in solid, nor in gas. Around a bend of quantum mechanics and at the foot of the electron ladder the basic notions of materialistic science such as matter, objective reality, time, space, causality, are no longer applicable, and the testimony of our senses largely loses its significance. The deterministic causality of the subatomic world is replaced by Heisenberg's principle of uncertainty, by fanciful "quantum jumps," or, in psychosocial phenomena, by "voluntaristic," free-willing laws of direction, or of immanent self-determination exempt from causality and chance. This last point is stressed by such leaders in the physical sciences as Max Planck, Einstein, Eddington, Schrödinger, Heisenberg, Margenau, Dirac, and many others.

Similar transformations have taken place in new theories of the biological, psychological and social sciences. Significant developments in these disciplines clearly show that the phenomena of life, organism, personality, mind and sociocultural processes are irreducible to, and cannot be understood as, purely materialistic, mechanistic and sensory realities. According to these theories they have, besides their empirical aspect, far more important rational and even supersensory and superrational aspects. The most modern science has already become notably Integral in comparison to that of the nineteenth century. This means an increasing replacement of the dying Sensate elements of science by the new Integral ones.

The Integral Conception of True and Total Reality

This replacement becomes clear if we take a few basic problems in physical, biological and social science, such as the problem of the true and total reality. Sensate science in the past explicitly and implicitly tended to reduce this reality either to matter or to sensory experience. Such a science either denied or doubted the existence of any nonsensory reality. At present, this concept of reality is largely abandoned by science as too narrow and inadequate. Today the total reality is thought of as the infinite X of numberless qualities and quantities: spiritual and material, temporal and timeless, ever-changing and unchangeable, personal, spatial and spaceless, one and many. In this sense it is conceived as the veritable *coincidentia oppositorum, mysterium tremendum* and *fascinosum*. In its totality it cannot be adequately described or denoted by any words, signs or symbols which have evolved for the description and definition of the finite, the limited and the specific differentiations of the infinite and total reality-value. They can define some of the ripples of this ocean, but not the ocean itself, which contains all but is not identical with any or all of them. Even the most general categories of our thought, like substance, quantity, quality, relation, time, space, subject-object, cause-effect, being-becoming, can identify the ripples but are inadequate for definition of the total cosmic reality-value. J. S. Brigena's "God Himself does not know *what* He is because God is not *what*," expresses this inadequacy of our terms and notions. Total reality is not identical with what or who, he,

she or it, matter or spirit, subject or object, or with any of its differentiations, and at the same time it contains all of these and more. This explains why many have called it "the Unutterable," "the Inexpressible," "the Divine Nothing" into which fade all things and differentiations.

On the other hand, being ourselves one of its important aspects, we can grasp roughly some of its important modes of being. Three basic forms appear to be essential: a) empirical-sensory, b) rational-mindful, and c) superrational-supersensory. The new conception of reality does not deny its sensory form, but regards it as only one of the three main aspects. This new conception is incomparably richer than the old one, and is at the same time much nearer to the true and total reality of practically all great religions.

The Integral Theory of Cognition and Creativity

In accordance with this trend, the scientific theory of cognition of the true reality has also changed. Though a few voices still intone John Locke's classical formula, ***Nihil esse in intellectu quod non fuerit prius in sensu,*** and its corollary that sensory perception and observation are the only means to scientific knowledge, this theory of cognition has become largely replaced by another theory closer to the new conception of reality. According to this new Integral theory of knowledge, we have not one but at least three different channels of cognition: sensory, rational and supersensory-superrational. The empirical aspect of total reality is perceived by us through our sense organs. The rational aspect of reality is comprehended by us mainly through our reason: mathematical and logical thought in all its forms. Finally, glimpses of the superrational-supersensory forms of reality are given to us by "intuition," "divine inspiration" or the "flash of enlightenment" of all creative geniuses: founders of great religions, sages, seers, prophets and teachers, scientists, philosophers, artists and leaders in all fields. These men unanimously testify the fact that their discoveries and creations have been inspired by intuition and then were developed and tested through the sensory and rational methods of cognition.

The Role of the Supraconscious in Discovery and Creativity

First, the supraconscious seems to be the fountainhead of the greatest achievements and discoveries in all fields of human creative activity. Without its genius and operation, only mediocre achievements are possible. A man may know excellently all the rational rules and techniques entering into the composition of a literary or musical masterpiece, and yet, if he is devoid of the supraconscious genius, he never can become even remotely akin to the Shakespeares and Chaucers, the Bachs and Beethovens.

Second, the supraconscious creates and discovers through intuition. This is quite different from sensory perception or observation, and from logical, mathematical and syllogistic reasoning. As evidence: (1) Intuitional inspiration or cognition comes as a momentary flash, in contrast to patient sensory observation or mathematical, logical analysis. (2) The time and the circumstances of this flash can hardly be foreseen, predicted or voluntarily produced. (3) It often occurs in the least expected moment and conditions. This is true of groups as well as of individuals; the stream of creativity swells and dries, in an unpredictable and fairly erratic manner. (4) The flash illumines the most essential nature of the intuited phenomenon, relationship or value. (5) The supraconscious intuition lies at the basis of the whole sensory and logical knowledge or value experience. (6) The supraconscious is egoless: it transcends ego entirely and unconditionally. Dominated by the supraconscious, an individual becomes its instrument, lifted far above personal limitations. (7) The supraconscious has been long noted under different terms, such as the self (vs. ego), atman, purusha, eternal reason, no-knowledge, nous, grace of God, divine or mystic revelation, pneuma, the *docta ignorantia,* inner light, and others. Genius, inspiration, creative *elán,* the "sovereign intelligence which sees in a twinkle of an eye the truth of all things in contrast to vain knowledge," are still other descriptions.

These are the essentials of what we know about the supraconscious. Its main function, seeming, is that of a stimulator and guide in discovery and creativity. In this capacity it cooperates with sensory and rational ways of knowing and creating, whose main functions seem to consist in developing and testing the illuminating idea granted by the supraconscious intuition. This means that each great human achievement is always the result of the unified work of all three—supraconscious, rational and sensory—ways of cognition and creativity. This fact warns us against acceptance of false "intuitions" as supraconscious insights. As a matter of fact, the grace of the latter in its full and pure form is visited upon only the few, and rarely at that.

The truth which is obtained through integral use of all these modes of knowing is fuller and greater than that achieved through one alone, be it either sensory perception, or logico-mathematical reasoning, or intuition. The history of human knowledge is a cemetery filled with wrong empirical observations, false reasonings, and pseudo-intuitions. In the integral use of all three, however, they supplement and balance one another. Integral cognition means that we learn about the total reality not only from empirical scientists and logical thinkers, but also from great religious and ethical leaders like Buddha, Jesus, Confucius and Lao-tze, and from the creative geniuses in the fine arts, like Beethoven and Mozart, Homer and Shakespeare, Phidias and Michelangelo.

For this reason, the new Integral theory is again more congenial to basic religious ideas than was the old Sensate theory of knowledge and creativeness.

The Integral Theory of Human Personality

The struggle between the old Sensate and the new, Integral culture or system of values can also be perceived in various

theories of human personality and of the human mind.

Sensate theories viewed man mainly as an animal organism of the *homo sapiens* species. They tended to interpret his nature and behavior predominantly in mechanistic, materialistic, reflexological and other "physicalistic" terms. Some of these theories have denied the reality of the human mind; others have recognized only two forms of mental energy: unconscious and conscious. Decadent Sensate theories, as exemplified by Freud, largely reduced mind or human psyche to the pan-sexual unconscious libido or id, filled with Oedipus, sadistic Tetanus and other complexes, with epiphenomenal ego and superego representing a modification of the same unconscious under the pressure of the family and society's censorship. This sort of theory of personality, wherein human nature is degraded to its lowest level, represents the nadir of Sensate conceptions of man.

Fortunately, increased knowledge of human personality has led to an essential repudiation of these decadent Sensate theories as scientifically unsound, aesthetically sterile, and ethically demoralizing. Reaction against them has led to the emergence of a new conception of man as an integral being. This view sees man not only as an animal organism but also as a rational thinker and doer and, further, as a supersensory and superrational being, an active and important participant in the creative processes of the cosmos. In addition to the unconscious and conscious aspects of his nature, he shows himself to be a supraconscious creator, capable of controlling and transcending his unconscious and conscious energies in his moments of "divine inspiration," in the periods of his highest and most intense creativity. As mentioned previously, man's greatest discoveries and achievements have been largely due to his ability to focus superconscious creativity, assisted by his powers of rational thought and of empirical observation and experiment. If man were an organism motivated and guided only by the libidinal and other forms of the unconscious, he would have had little more chance to become a creative agent in the universe than the other biological species which are also endowed with the reflexological-instinctive unconscious and with the rudiments of the conscious mind. The fact that *homo sapiens* has a developed rational mind overshadowed by the superconscious has permitted him to exercise an astonishing, evergrowing creativity. The new, Integral theory of human personality recognizes the validity of each of these three aspects of man. It is, in fact, a more precise formulation of the triadic conceptions prevalent in the great religions, which view man as having these three forms of being: 1) the unconscious (reflexo-instinctive mechanism of body); 2) the conscious (rational mind); and 3) the supraconscious creator (Nous, Pneuma, Spirit, Soul, Divine Self). It is in the rational and the superconscious levels of man that the answers may be found to the ancient question: "What is man, that thou shouldst magnify him?"

The Struggle for Existence vs Creative, Unselfish Love

As a further example of the struggle between the decaying Sensate and the emerging Integral orders, we can take the problem of the main factors of biological evolution of the species, of human behavior, and of the mental, moral and social progress of mankind. The biological, psychological and sociological theories of the nineteenth and early twentieth centuries viewed the competitive struggle for existence as the main factor of evolution and of human progress. Economics and other social disciplines have been based upon the postulate of the *egotistic* man, motivated entirely by his selfish interests and relentlessly pursuing these objectives.

These Sensate beliefs have been unblushingly implemented. They have resulted in the genocidal wars of this century, with their mass murders of non-combatants, including children, in the wholesale destruction of cities and populated regions, and in the armament race and preparation for the next—nuclear and bacteriological—war. In these and similar ways, advocates of these Sensate theories, especially the governments of the mighty nations, have declared themselves free from the restraints of international law and from the moral precepts of the great religions and ethical systems. In brief, during the last few decades degenerate Sensate theories and practices have led mankind to the extreme of ideological and practical demoralization—publicly approved and supported by a large portion both of the Western and the Soviet blocs of nations.

Fortunately for all of us, during the same period which has witnessed the disintegration of Sensate cultural theory, new and quite different theories and practices have been emerging and gaining strength. These have convincingly shown that mutual aid, cooperation and love have been at least as important as the struggle for existence in biological evolution, and of incomparably greater effect in human progress. These new theories have shown that in his sound and creative behavior man is motivated by sympathy, benevolence and unselfish love rather than by egotism, hate and cruelty. What is more, the energy of this love is indispensable for the generation, continuity and growth of living forms, for the survival and multiplication of the species, and particularly for the health of infants and their growth into mentally and morally sound citizens. Recent studies have also disclosed that love is a powerful antidote against criminal, morbid and suicidal tendencies and against hate, fear and psychoneuroses; that it performs important cognitive and aesthetic functions and is the most effective educational force for the enlightenment of humanity; that it is the heart of a true freedom; that it can remove interindividual and intergroup conflicts, and transform inimical relationships into friendship. It is even true that altruistic persons live longer than those who are egotistic. Finally, some minimum of unselfish love is absolutely necessary

for the durable existence of any society. At the present catastrophic moment of human history, an increase of altruism in individuals and groups and a universal extension of unselfish love are essential if new wars are to be prevented, and mankind freed from its gravest ills.

The Reunification of Truth, Goodness and Beauty

In concise outline, these are the three great trends of our time. If they are adequately grasped, thousands of single events and changes which happen every day become comprehensible; some can even be foreseen and predicted.

Among other things, we can see that the new rising sociocultural order promises to shelter a spontaneous unification of religion, philosophy, science, ethics and the fine arts into one integrated system of values based on truth, goodness and beauty. Such a unification implies the end of the conflict between science and the humanities which has characterized the over-ripe Sensate order. In terms of Saint Simon's theory of the "critical" and "organic" periods in the life of great cultures, this unification means the beginning of a new organic era in the history of mankind.

This struggle between the forces of the now largely outworn Sensate order and the emerging new Integral order is proceeding relentlessly in all the social and cultural fields, and in the inner life of everyone. The final outcome of this epochal struggle will depend to large extent upon whether mankind can avoid a new world war. If this Apocalyptic catastrophe can be avoided, then the emerging creative forces will usher humanity into a magnificent era of its history.

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HENRYK SKOLIMOWSKI

A Way Out of the Abyss

A PHILOSOPHY OF TECHNOLOGY AS A PHILOSOPHY OF MAN

A Preamble on Change

THE ANCIENT CHINESE had a saying: "I curse you to live in an age of change." For better or worse, Western civilization has almost continuously, particularly during the last century, lived in the time of change. We have reversed the Chinese dictum and persuaded ourselves that change is not a curse but a blessing, for it means "progress." We have also persuaded ourselves that no change means no progress—that it means stagnation and ultimately unfulfillment. In this scheme of things, change is conceived as an agent of progress; moreover, the concept is restricted to external change—to its outer and most visible manifestations.

Incidentally, although change is built, as an implicit presupposition, into our metaphysics of progress (which is really a metaphysics of movement; we always go forward even if we go nowhere), there is little understanding of the concept of *change* itself. This is a curious facet of our conception of the world. We are constantly moving, constantly and deliberately causing change as the vehicle of progress. But our understanding of change itself is very superficial and tenuous. Within the scope of our empiricist epistemology (under the auspices of which we have carried on our concept of progress), the concept of "change" is conceived as linear, homogeneous, almost mechanical. On the other hand, if change is to be conceived in such a way as to bring about *qualitative* progress, it must be understood as dynamic and non-linear. Whitehead comprehended this very well, but most empiricists, as well as prophets of technological progress, lack this understanding. They do not see, to begin with, that the concept of change is itself a bewildering social and philosophical problem.

We know that technology flourished in China in the 14th century, that is, prior to the European Renaissance and long before the Western scientific revolution. This has two important implications. First, it weakens the familiar contention that a scientific revolution is a necessary prerequisite for the flourishing of technology. Second, it negates the common argument that when technology flourishes it always brings about social and political, as well as physical, change. In 14th century China, the flowering of technology did not result in major change because technology perfectly met the demands and expectations made of it. Technology was therefore kept in a subdued position, as a deferential tool, not as the spearhead of progress. From the Western point of view, the

contention that "there is no need for change" is regarded as an expression of backwardness, stagnation, decay. But the Chinese civilization was doing quite well at the time. We must realize that the difference in perspective between the 14th century Chinese mind and the modern occidental mind is not a small peripheral issue, but that it signifies different castes of mind, indeed, different world views.

Since we in the West consider change to be simply an agent of progress, and since progress is to us necessary to life, we regard change as part of the very substance of our life. Like a perpetual motion, it must go on and on—regardless of human cost. When we afford ourselves the luxury of reflection and pause for a moment, however, we realize at once how strange it is for a human being to permit himself to be caught up in perpetual irrational motion. Yet change has become the driving force of our civilization. We do not question the validity of this because we have accepted progress virtually without criticism, as an absolute value: "No one can be against progress." Although we praise ourselves for being thoroughly rational, our Western metaphysics, with its concealed myths of progress and change, is not less mysterious or more rationally justified than the metaphysics of other civilizations which we often deplore. Only history will reveal where the ultimate wisdom may lie— in the ancient Chinese culture which resisted change, or in the Western culture which adopted change as its major modality of existence.

In point of fact, history is already beginning to tell us something significant in this regard. We are becoming increasingly persuaded that the period of explosive material growth is coming to an end. This definitely signals the end of the period of incessant external change, and thus the end of our acceptance of change as a vehicle of cultural progress. We are clearly heading towards a "steady state." In this steady state, whatever its ultimate form may take, we will be required to abandon the myth of constant progress.

The Need for a Philosophy of Technology

Leaving aside the concept of change, let us ask ourselves: what is the reason for the sudden emergence of the philosophy of technology? Why are we so concerned with the *future* of technology? However paradoxical it may sound, I would like to suggest that the philosophy of technology, and our discussions about the future of technology, do not have much to do with technology as such.

The emergence of the philosophy of technology signals a delayed recognition of the importance of technology in our civilization. The increasing awareness that Western culture may be breaking down has made us search for causes and examine facets of modern society which we have hitherto ignored, neglected and overlooked. In the phenomenon of technology, we find a focal point, for here many conceptual and ideological paths converge. To grasp these converging paths is to grasp the main configurations of the network within which our civilization operates. By these converging paths, I mean such concepts as "progress," "nature," "invention," "rationality," "efficiency." The philosophy of technology is, in other words, philosophy of culture—a philosophy of man in a civilization which has found itself at an impasse, which is threatened by excessive specialization, fragmentation, and atomization, and which is becoming aware that it has chosen a mistaken idiom for its interaction with nature.

The essential point about our present debate is that it reaches to the very core of ideas and ideals which have sustained our whole civilization and which are built into its foundations. What is at stake is the viability of our entire intellectual apparatus (which forms the backbone of what is known as the scientific-technological world-view) for coping with the planetary ecosystem, and for sustaining us in our further growth as human beings and as humane societies. Debates about the future of technology in this context are not about technology itself, but about the future of a civilization and perhaps of mankind. We are little interested in the future of the technology of cutting tools, for example, or of basket-weaving, for that matter. But we are vitally interested in the future of technology conceived as one total unified phenomenon. This phenomenon is interlinked in an extraordinary variety of ways with human society; it has indeed become a factor determining the future of society. To use a Heideggerian term, technology has become a part of the being of man. As long as its influence on us (on our progress and development) was, or was thought to be, beneficial, we welcomed the symbiosis of man and machine. In the 1920's and 1930's, amidst the

— Robert Jacobsen: Figurine

technological euphoria, Le Corbusier, Buckminster Fuller and other progressive thinkers called a house "a machine for living." This euphoria has now left us. In consequence, we are led to re-examine our entire technological achievement as a human heritage.

A culture threatened by excessive instrumentalization reacts in diverse ways, and seeks redress through excursions beyond its restrictive bounds, whether by means of drugs or through the more legitimate application of Eastern philosophies. The emergence of a philosophy of technology is yet another reaction of a culture in peril of being strangled by excessive instrumentalization. For, to repeat, debates over the nature of technology are discussions over the future of man. Whether we like it or not, whether we are well-prepared or ill-prepared, we are participants in a seminal debate over the fate and vicissitudes of a civilization whose custodians we are. Such a responsibility has always been the privilege and the pain of those who take an active and concerned part in facing crises and dilemmas that afflict the human condition.

I am in full agreement with Spengler, who ascertains that *"Technics is the tactics of living;* it is the inner form of which the *procedure* of conflict—the conflict that is identical with Life itself—is the outward expression." And he continues, *"Technics is not to be understood in terms of the implement.* What matters is not how one fashions things, but *what one does with them.* . . . Always it is a matter of *purposive activity,* never of *things."*[1] In a similar vein, Ortega y Gasset considers technology to be "the system of activities through which man endeavors to realize the extra natural program, that is, himself."

In spite of their enormous bulk, the techniques present-day technology offers us are insufficient, and in many ways defective, as *tactics of living.* Herein lies one of the basic reasons for our concern with the philosophy of technology. In order to improve our tactics of living, in order to re-direct the course of technology so that it provides a new tactics of living, we must create a new kind of knowledge, a new discipline within which we can effectively re-think our present dilemmas. For lack of a better term, this new discipline could be called the philosophy of technology. This, however, must not be conceived as a mere scholastic discipline. I am not suggesting that a scholastic approach does not give some comfort and aesthetic pleasure to those engaged in it. The amusement of the mind and the satisfaction of personal predilections are very important, at least to the individual engaged in these pursuits. But let us not pretend that neat logical systems which satisfy the fastidious bent of one's mind can exhaust the scope of the philosophy of technology. We must be aware, above all, that the philosophy of technology has emerged as the result of a critical appraisal of the state of our civilization, and not in order to provide some analytically minded philosophers with a platform on which they can perform new technical exercises. Let us not delude ourselves that the development of more technicians, whether of a linguistic-analytical or any other variety, will solve problems of technology at large—problems which are thrust upon us, and which have become a main concern of our civilization. It is our responsibility as philosophers, scientists, historians, engineers, politicians and, in short, enlightened citizens, to meet those problems which we, as a civilization, have originated.

The Need for a New World View

A philosophical analysis of technology is nothing new. Aristotle engaged in it, and, in more recent times, Spengler, Heidegger, Ortega, Mumford, and others have contributed their share. But we are finding that the phenomenon of technology is more complex and more far-reaching than their analyses would seem to suggest. Unfortunately, contemporary philosophers have by and large ignored the problem, with the one salutary exception of Mario Bunge. In actual fact, I accept Bunge's conceptual analyses of technology, and particularly his explicit claim that technology contains in itself a metaphysics, an epistemology, and an ethics.[2] But I find Bunge's program (though rigorous and yielding some illuminating results) to be fundamentally limited and, in an essential sense, defective.

Bunge accepts a certain conceptual matrix within which he analyzes the metaphysical foundations of Western technology. This conceptual matrix, however, is part of the Western world-view—a world-view, we must remember, which has been shaped by the scientific and technological rationality. Thus a conceptual analysis of technology which is conducted within the framework, and more specifically, within the world-view established by science and technology, is self-limiting, and likely to be partial and inadequate.

When we seek an understanding of science and technology in order to comprehend the course and the vicissitudes of our whole civilization, we seek a perspective which places us above the partial and even partisan world-view which we have come to recognize as the scientific-technological *Weltanschauung.** However, every metaphysics is selective, neglecting certain aspects of the world in order to concentrate on other aspects. No metaphysics is totally inclusive, or can give us perfect and complete knowledge. Every metaphysics operates with a set of categories and concepts through which it renders the various aspects of the world as it conceives them. Concepts and categories, and in general, the language of a given metaphysics, are not incidental but intrinsic features of that metaphysics; they serve to articulate the world in a specific way. A given language is specific to a given metaphysics; if we accept the language, we necessarily accept its articulation of the world. In short, when we accept a language (its categories, concepts and distinctions) we accept the world-view embedded in this language, as Ajdukiewicz, Cassirer, Whorf

* Bunge's conceptual analyses of technology are at least partly self-referential: they use conceptual components of the world-view they wish to appraise and possibly transcend.

and Northrop have effectively shown.[3] One of the reasons for our difficulties in overcoming the limitations of our present world-view is that we seem constrained to use the language which articulates this world-view.

I am not suggesting that we should abandon the conceptual analyses of technology within the present system, but rather that we should apply ourselves to what is a more important task: *we need to develop alternative world-views, alternative metaphysics, as the basis for reflection on technology vis-à-vis society and civilization.* As we have noted, every metaphysics provides different ways of comprehending reality. Conceptual analyses of science and technology within an alternative world-view may, and almost certainly will, result in a different appraisal of science and technology for humanity. In short, the way towards understanding the metaphysical roots of technology, the way towards creating an alternative humanistic technology, must lead through the creation of an alternative world-view (metaphysics) which will enable us to grasp sharply and clearly ramifications and consequences of present technology for a future humane society. The task of criticizing our technological culture in terms of alternative metaphysics could be the most exciting intellectual challenge of our times, with profound and far-reaching practical consequences.

— Lichenstein: "This must be the place."

How, then, do we begin? It is clear that we must re-examine our entire intellectual heritage in the light of our present situation. For we are at a juncture where philosophy has not infrequently found itself in the past: we are reassembling the conceptual fragments of a civilization. In such a reconstruction, we are forced to concentrate on one element: the phenomenon of technology. But this does not minimize our task, for the reconstruction will require much more than a reshuffling of present categories of knowledge. What we are confronted with is not merely a puzzle that can be easily solved within the existing conceptual apparatus, but a major crisis which will require an alternative set of conceptual structures, and even an alternative view of knowledge. I hope it will not be taken as entirely facetious or outlandish when I suggest that philosophers, scientists, engineers and historians will have to "re-school" themselves in order to rethink the present predicament. Not in our present schools and academies, however, for these can only enhance our present conceptual tendencies, but rather in contexts wherein alternative ways of viewing reality will be opened up. For example, philosophers, futurologists, and all the other people who are concerned with the future of technology and thus with the future of our culture, would benefit enormously from an encounter with the alternative world-views of an American Indian culture in an authentic setting, where such world-views are an intrinsic part of an alternative way of life. Or they should experience the life of an Oriental or African society in which alternative ways of interpreting the world are still viable, and form an alternative basis of knowledge and of life.

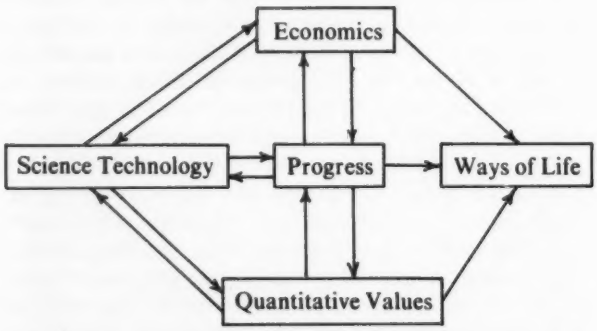
I am thus suggesting that we may not be able to rethink our predicament "on our own," so to speak, for our system of knowledge is self-referential. This system permits the existence of only those phenomena which support the claims of the system. It excludes or minimizes phenomena and attitudes which seem to undermine the stability of the system. In the present scheme of things, technology is a part of our secular world-view. Our affection for and attachment to it are not merely an infatuation with superficial gadgets. They are rather the result of a long intellectual tradition, a result of our longing for freedom of action and of our confidence in the instrument we have created and perfected for this end. This instrument, paradoxical as it may seem, has been endowed with more than merely instrumental functions: it was conceived as the means of human liberation, as a Noah's ark of hope, of prosperity, of progress. All these longings and transcendental yearnings have become incorporated into our notion of technology. For this reason, not only technocrats and simple-minded technicians with vested interests in technology, but also Nobel Prize winners* unhesitatingly insist that what has been spoiled by technology will be and can be cured by

* Such as Sir Peter Medawar.

technology. These extravagant claims may seem naive when they are put forward by sophisticated minds which in other contexts exhibit ruthless critical acumen. However, it is not mere naiveté that prompts them to defend present technology so staunchly. It is rather an extraordinary commitment to the present world-view that prompts them to take such a stand.

The power of the myth of technology is strong and dangerous precisely because it has pervaded the recesses of our (Western) mentality. Technology has become *our method*, physically and mentally, to such a pervasive and perverse degree that even when we realize that it devastates our natural and human habitat, our immediate reaction is to think about another technology which will mend it all. Technology is a state of Western consciousness in which "control" and "manipulation" are dominant features. This is perhaps the fundamental reason why we cannot tame the existing technology, and why these "most efficient ways" consist almost invariably in further manipulation and fragmentation—the very processes which are at the core of our trouble.[4]

We must understand, therefore, that any attempt to humanize the present system by injecting more humane values into it is doomed to failure, for the system is extremely resistant to such "cosmetic" operations. The present order of Western society, out of which has grown our way of life, is based to a very great degree on quantitative instrumental values. It is in terms of these values that most, if not all, social and political assessments are made. The structure is exceedingly complex, but its various parts interpenetrate and support each other:



Thus it is not sufficient to decorate the present quantitative system with some intrinsic human values by merely adding on human considerations here and there. As long as the quantitative instrumental basis remains unchanged and channels its imperative via descriptive science, via industrial profit-efficiency-oriented technology, via economics geared to continuous growth and free enterprise, the order of things will remain the same, and we shall have to endure the same quantity-ridden way of life which has been imposed on us.

Indeed, even the prevalent approaches to values cultivated by the majority of contemporary philosophers are reductionist, and indirectly serve the cause of the quantitative world view. There are at least four reductionist approaches that are prominent nowadays:

(1) The *Linguistic Approach*, prevalent among analytic philosophers (especially exemplified by the late J. L. Austin),[5] which insists that we must first study the structure of moral utterances, and from this study derive insight into the nature of moral phenomena. Unfortunately, the exercise of studying moral utterances has become an end in itself. We have a proliferation of types of moral utterances, but no comprehension of moral phenomena.

(2) The *Formalist Approach*, prevalent among logicians (especially exemplified by von Wright),[6] which is only a more rigorous application of the linguistic approach, for it insists that we must study first the *logical* structure of moral utterances and then derive insight into the nature of moral phenomena. So far this has been a merely formal exercise which resulted in a proliferation of logical systems without corresponding comprehension of moral phenomena.

(3) The *Simple-minded Approach*, prevalent among optimistic technocrats (especially exemplified by E. Mesthene),[7] which equates material choices with all human choices, freedom to possess material objects with total freedom, and is content to suggest that technological values are tantamount to human values.

(4) The *Simplistic Mathematical Approach*, prevalent among enlightened technocrats and systems analysts (especially exemplified by A. Rosenstein), which seeks simple mathematical functions for the maximization of values (very much in the style of Jeremy Bentham and his idea of the Felicific Calculus), as if values were simple interchangeable economic commodities.

In all these approaches, values are *reduced* to something other than they are: linguistic utterances, logical structures, technological commodities, mathematical functions.

To change the predominantly quantitative temper of our civilization will require a thorough-going change in our modes of understanding, in our institutions, in our consciousness. The quantitative civilization that the West has developed is at once a great achievement of the human mind and a great aberration of the human mind, for we have pushed the achievement too far, and attempted to reduce all qualities to easily quantifiable physical entities.

In the context of our argument, present technology will have to be viewed as incomplete and insufficient—as a voyage which has not delivered us to the promised land, but which has at least shown us where the promised land does *not* lie. Human culture has always voyaged towards an uncertain, even dangerous future; this is a never-ending process, intrinsic to the human condition.

Some years ago, under the auspices of AAAS and The Society for the History of Technology, a symposium devoted to the exploration of the philosophy of technology was held in San Francisco. During the last few years the

philosophy of technology has emerged, not so much created by the laborious efforts of diligent scholars as by the urgency and magnitude of the social and human problems arising from the interaction of society with technology. It is no longer a question whether there is a field called the philosophy of technology. The question is rather whether we are to conceive it narrowly, confining ourselves to problems suited to present analytical techniques, or whether we conceive it comprehensively, attempting to meet the challenge of our times by rethinking our basic presuppositions, assumptions and modes of thought which, at least in part, have led to our present predicament. I consider the latter not so much a choice as an imperative. In trying to create a philosophy of technology equal to the measure of our problems and on the scale of our times, we might be able to work out new tactics for living. What is more, we might be able to give a new moral impulse to students and society in general, whose members are subjugated by the overwhelmingly quantitative style of life in Western culture. We might be able to awaken philosophers and students of philosophy from their analytical slumber, and show them once more what an exciting and creative enterprise philosophy really is. Last but not least, we might be able to justify our claims, as thinkers and scholars, to the support of society—a support which is justified only because of the help we can give it. We have been miserably failing society in this task. The philosophy of technology is not a panacea which will cure all ills, but it might bring the causes and possible cures for the illnesses into clearer view.

In sum, the philosophy of technology conceived as a philosophy of man would insist

- That technology is subject to the human imperative, not that man is subject to the technological imperative,[8]
- That man respects the delicate balances of nature and permits only an instrumentation of the world that enhances these balances without undermining them;
- That man's knowledge is not power to control and manipulate, but rather power to understand and to integrate himself into the larger order of the world;
- That man's concept of progress does not necessitate the extinction of other creatures, with the concomitant deadening of man's spirituality and sensibility, but rather the enhancement of the diversity of the human world which is mainly accomplished by the enlargement of his spirituality;
- That we can learn a fundamental lesson from societies and cultures which we have treated too lightly, even contemptuously, in the past, but which have preserved sanity, unity and coherence by consciously integrating themselves into schemes of life which are larger and more encompassing than the pursuit of material progress.

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3. We suggest: K. Ajdukiewicz. *Pisma wybrane* (Selected Papers), B. L. Whorf, *Language, Thought and Reality*, F. S. C. Northrop, *Meeting of East and West*, E. Cassirer, *Philosophy of Symbolic Forms*, vol. 1, Language.
4. For further discussion of this point, see Henryk Skolimowski, "Technology vs. Nature," *Ecologist* (London), February 1973; also "The Scientific World View and the Illusions of Progress," *Social Research*, Spring, 1974.
5. J. L. Austin, *Philosophical Papers*.
6. Georg Henrik van Wright, *Norm and Action*.
7. Emanuel Mesthene, *Technology and Social Change*.
8. Ferkiss *(Technological Man)*, Skinner *(Beyond Freedom and Dignity)*, and Toffler *(Future Shock)* think that it should be the other way around, that man should give way to the technological imperative: that man should adjust himself to the technological system (Skinner), make himself in the image of "rational" technology (Ferkiss), consider human societies as disposable as automobiles (Toffler). One wonders whether it is the system that produces Ferkisses, Skinners and Tofflers, or whether we simply allowed Ferkisses, Skinners and Tofflers to make the system in their own image.

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. . . there is announced here a still unspoken gathering
of the whole of Western fate,
the gathering from which alone the Occident can go forth
to meet its coming decisions—to become, perhaps
and in a wholly other mode, a land of dawn, an Orient.
— Heidegger, *What Is Called Thinking?*, Harper Torchbook, 1968, pp. 60-70.

F. S. C. NORTHROP

*The Wedding of the World's Civilizations**

THE DIFFERENTIATIONS OF EASTERN AND WESTERN CULTURES FIND COMMON GROUND IN THE UNDIFFERENTIATEDNESS CONSCIOUSNESS WITHIN WHICH ALL PARTICULARITIES COME AND GO

WHEN ONE EXAMINES the present encounter between the world's major civilizations, one sees that the peoples of Africa and Asia are adopting two major things from the modern West. The first is its technology, which requires of its creative practitioners a deep understanding of mathematical physics. The second is its contractual law, which entails a somewhat similar kind of imageless abstract thinking.

The world-embracing impact of modern science and its instruments is well known. The similar influence of contractual law is less generally recognized, but even more important, since it transforms not merely the instrumental values, but also the religious and political ideals and de facto normative social customs of a people.

This becomes evident when one notes how the recent new nations of Asia and Africa arose. First, their respective peoples had to achieve political independence from their Western rulers. This they did by appeal to the Westerners' own contractual legal and political principles, which were stated most clearly by the Stoics, Locke and especially Jefferson in the Declaration of Independence and the Bill of Rights of the American Constitution, upon which he insisted. Having thus succeeded in achieving independence, the leaders then had to decide what legal and political form their new nation would take. Had they returned to their religious, political and social beliefs and customs antecedent to the coming of the Western imperialists, there would be as many nations in Africa today, each rooted in racial purity and hierarchical tribal loyalty and authority, as there are countless local African tribes; and there would be as many theocratic nations in geographical India, at the present moment, under racially pure Aryan Hindu, high-caste religious and legal leadership as there were countless Hindu maharajas, to say nothing about the many medieval, theocratic Muslim Princely States. Clearly, this was not the choice that they made. Instead, they appointed a constitutional committee, composed of members trained in the constitutional, fiscal, and other constructs of Western contractual legal science, and authorized them to frame a constitution and nation, together with its monetary system, in which normatively all individual persons stand equally before a democratically determined contractual common law. A typical result is the Constitution of Free India with its Fundamental Freedoms that explicitly repudiate racial purity, patriarchal kinship, sexual primacy or joint-familial loyalty as the good,

* *Revised from a lecture by Dr. Northrop, who is Sterling Professor of Law and Philosophy at Yale University, which was given in New York City on February 16, 1965, as part of a series on "Science and the Recovery of Meaning," under the sponsorship of the Foundation for Integrative Education.*

religiously or secularly, in either the state or social customs.

The economic legal construct is as important as the political and the normatively social in each of these new nations. There is, for example, the Bank of India and the Bank of Ghana after the manner of the Bank of England or the American Federal Reserve System. The existence of these fiscal institutions demonstrates the error in the frequency stated affirmation that economics is the key to law and politics, history, and everything else in the contemporary world. This error overlooks the fact that all contemporary economic, as well as political, institutions and transactions are contractual legal agreements and constructs. Like the unobservable, but indirectly and empirically confirmed elementary scientific objects of mathematical physics, the economic entities and activities of today's world are unobservable constructs of thought, subject, when correctly understood and operated, only to the contractually legal properties assigned to them syntactically by the construct, and made concrete and existential only indirectly by operational rules and acts of incorporation, or the like.

Consider a contemporary example: The General Motors Corporation. What is this entity? If we try to think of it in common-sense terms, we may visualize large factories in Detroit and elsewhere, but we soon realize that these do not make up its essential nature. For the factories may burn down or be replaced, with the General Motors Corporation preserving its identity through all these changes. Nor does the answer become any clearer if we shift attention from the buildings to the persons who administer this Corporation. They, too, successively die, though the Corporation persists. Moreover, they find themselves in trouble with the law unless they behave in accord with the contractual legal norms of incorporated entities. This suggests the answer to our question. The General Motors Corporation is a material instance of a contractual legal construct. More specifically, being incorporated in Delaware, it has the properties assigned to that fictitious construct of the Delaware legislative statutes which define syntactically the meaning of a limited liability corporation. Were it incorporated in Maine, it would be a similar, but none the less, in specific respects, slightly different entity.

The more precise meaning of what is being imported today from the modern West should now be evident. Briefly stated, the leaders of the new nations everywhere are importing the fruits of imageless, syntactically relational construct thinking. They are doing this with respect to natural science and descriptive theory of what *is*, and also in the humanities, including law, politics and economics, with respect to the norms that prescribe what *ought to be*.

The educational implication is obvious. The domestic cultural and the international problems arising from the present wedding of the world's civilizations cannot be understood, to say nothing about being constructively and peacefully solved, unless our entire educational system everywhere is radically reformed to make imageless, many-termed relational construct thinking elemental and continuous throughout the entire educational process, beginning in the most elementary grades. The important point to realize is that such education is as essential for an understanding of human values and the humanities as it is for a comprehension of mathematical physics and contemporary scientific technology.

Up to this point, we have been concerned with those factors in the present encounter between the world's major geographical areas and cultures which the rest of the world is taking from the modern West. In the contemporary West itself a scientific and philosophical reconstruction of its basic beliefs has occurred which already shows signs of making necessary a converse influence of the oldest Asian and non-Western cultures on Occidental thinking and behavior. Briefly put, there are reasons for believing that the modern Western world has, in our century, come to its end in precisely the same fundamental sense in which the medieval Western world came to its end when Galilei, Newton, Descartes and Locke articulated what seemed to them to be the basic scientific and philosophical beliefs of the modern era.

Perhaps the best way for me to approach the more concrete and positive meaning of what has happened is in autobiographical terms. In the early 1920's I went to the Imperial College of Science and Technology in London, to study the fundamental concepts in the scientific and mathematical reconstruction that occurred at the opening of this century, when Whitehead and Russell wrote their *Principia Mathematica*, Planck discovered the quantum of what later became quantum mechanics, and Einstein formulated his Special and General Theories of Relativity. The first time that I saw Whitehead, he said two things to me. The first was, "You must spend your days and your nights with Hume." The second was, "One cannot be too suspicious of ordinary language in science and philosophy."

What do these two statements mean? It is only in the last few years that I have come to what seems to me to be an understanding of Whitehead's words. Korzybski, incidentally, utters the same warning in his epistemology and semantics, urging us to beware of Aristotelian thinking, which is what he calls ordinary language thinking. If we amend Whitehead's statement slightly, it comes to read, "One cannot be too suspicious of any ordinary Aryan language in science and philosophy." This, of course, includes Greek, Latin, French, German, Spanish, i.e., all the ordinary languages of the Western world, and, in addition, the Sanskrit of Aryan-Hindu India.

Why should we be suspicious of this kind of language? Its nature is that it has what logicians and epistemologists call a two-termed relational, thing-property, syntax. This means that when we make a descriptive factual statement

of any kind, our sentence must have a noun and a predicate term related to that noun by some form of the verb "to be." This is a requirement for correct English or Greek, Latin or Sanskrit usage. Such a syntatical language structure has the effect of causing us unconsciously to describe the facts of our experience in terms of things and their properties. Aristotle's physics was of this character, and so is ordinary common-sense thinking. Let me illustrate.

I experience an immediately sensed color which I denote linguistically with the word *blue*. Our Aryan prose syntax then leads me to put a substance beneath, so to speak, this quality, thereby providing the noun of which the *blue* is a predicate. The result is the apparently innocuous sentence, "The water is blue." But one finds, with further observation, that this language lands one in certain difficulties. In the summer I live on the top of Shepherd's Hill overlooking a lake in New Hampshire. On a beautiful sunny morning I look out from my open screened study to immediately experience an emotively moving, vivid panoramic aesthetic continuum that is differentiated by countless colors, odors, and delicate sounds and occasional coolnesses standing clearly in a many-termed relation to one another. Even so, if I don't watch out, my ordinary language will cause me to single out but one of these multi-relational aesthetic qualities and say, "The water in Squam Lake is blue." A little later I walk down through the woods to the lake for a swim and notice, when I cup up a handful of its water to cool my head before the shock of plunging into that spring-fed lake, that "the water in Squam Lake" directly before my eyes in my hands is not *blue* but colorless. Then, following the syntax of Aryan language, I am on second thought liable to say that "The water in Squam Lake *appeared* to be blue," since, of course, I now know that "It is *really* colorless." Thus it never occurs to me that I should throw out all these substances underneath the blue that I first saw, the crystal clarity that I now see, and the terrifying blackness which I may later see when a dense thundercloud fills the sky. Instead, keeping the two-termed noun-predicate syntax of ordinary language, I populate the universe, since "the water is *really* colorless" with completely unaesthetic and unemotional little billiard balls too small to see, called "material substances." Thus, the materialists are born and, in the name of a factual description of observable experience and of physical science, the entire world of emotive, concrete, factual and aesthetic immediacy is turned into a phantasmic projection called "a mere appearance." Forthwith, art becomes effeminate and superficial; religion and morals lose their aesthetic and emotive sensitivity. Worst of all, in international law and politics, where, as noted above, normative, interpersonal universal lawfulness is of the essence, the self-defeating, tough-minded, heavy hardware power politicians pose as realists.

But this is not all. If our two-termed subject-predicate ordinary language syntax is to be saved, there must be an underlying substance as the projector of the phantasmic appearance which is purportedly the world of both cosmic and human nature which we directly observe. Moreover, the immediately experienced fact of emotive experience and consciousness cannot be denied. Ordinary language thing-property thinking thus leads one to add to the underlying unconscious and unaesthetic material substances a similarly unobserved spiritual or mental substance, as the projector of the phantasmic appearances and the subject of both emotive consciousness and thought. In this manner we find ourselves with the basic scientific, psychological and philosophical beliefs upon which both Descartes and Locke articulated modern mathematical physics and reared the modern world. Everything in both nature and human nature was conceived as an interaction between an aggregate of mental and material substances.

The theory was no more than formulated, when Descartes was asked where, in terms of this belief, the mind contacts the body. His answer was more amusing than illuminating and made evident to subsequent psychologists and philosophers that it leaves one with an insoluble body-mind problem.

Seen from the standpoint of the syntax of language, this traditional modern belief may be described as the product of taking the many-termed relational concrete facts of immediate experience and the inferred many-termed relational constructs of mathematical physics, and completely misunderstanding and misdescribing them by thrusting them into the Procrustean bed which is the thing-property thinking of the two-termed syntax of ordinary Aryan prose.

One meaning, at least, of Whitehead's statement that one cannot be too suspicious of ordinary language in science and philosophy should now be clear. What of his other statement to the effect that one must spend one's days and nights with Hume?

Hume's importance in the modern Western world is that more than anyone else, except William James, he brings our attention back to the immediately experienced facts of concrete experience, including both those of the so-called outer senses and those of the so-called inner introspection; thereby he makes it evident to modern Western thinkers, as did the Buddhists and nondualistic Vedantic Hindus in ancient Asia, and the Sophists, Democritean, Platonic and Stoic Roman thinkers in ancient Greece, that neither outer nor inner radically empirical immediate experience warrants the belief in a substance of any kind, be it material or mental.

At this point, the contemporary Western civilization and the ancient Asian civilizations which are meeting today find something in common. For both, the material substances of the materialists and the mental substances of the personalistic pluralists and spiritualists are linguistic and metaphysical nonsense.

It does not follow from this, however, as the aforementioned Asians, the Greek Sophists and the modern

Humean radical empirical positivists concluded, that there are no persisting entities and relations. All that follows is that the latter type of entities must be known and acquire their meaning in some other way than by reference to the directly observed. This other way the Democritean, Platonic, Stoic and contemporary mathematical physicists and philosophers of this subject know to be that of the aforementioned many-termed relational syntactical constructs. It was the discovery of these imageless constructs first made by Democritean, Platonic and Stoic mathematical physicists, and then applied to normative subjects by the Stoic legal scientists, that produced the Western contractual law of constructs which is today transforming the normative beliefs and customs of people throughout the entire world.

There is a further similarity between the Asian Buddhists and nondualistic Vedantic Hindus and the contemporary Western radical empiricists who have spent their days and nights with Hume. The generally accepted theory of ancient India's philosophy prior to the Buddha was Vaisesika dualism. Its position is similar, if not identical with the Lockean-Cartesian doctrine of mental and material substances with which the modern Western world began. Like the modern materialistic Hobbes, the Buddhists began their attack on this position by denying the meaningfulness or reality of any mental substance, while retaining material substances. This version of Buddhism is called realistic Hinayana. Then they proceed, after the manner of Bishop Berkeley in the modern West, to show that direct observation gives no warrant for the meaningfulness or existence of material substances, or the belief that we directly sense external public objects of any kind. But unlike Berkeley, who retained the belief in mental substances, this second movement in Buddhism rejected mental substances also. In this respect they did for ancient Asia what Hume made clear to the modern West. Positively expressed, this Buddhist equivalent of Hume is like what was called earlier in this century "neutral monism." This is the thesis that a noun such as mind is but a tag for a sequence of directly inspected feelings and images succeeding one another in time and perpetually perishing. Similarly, the noun "matter" is but a tag for such a sequence of perishing images of the so-called outer senses.

Buddhism, like the later nondualistic Vedantic Hinduism of Sankara, does not rest here, however. Both go on to point out that there is one factor in directly experienced, radically empirical immediacy which is not relative to the observer and not a perishing particular, and which is and remains always the same, both cosmically in nature and psychically within each one of us. This timeless factor the Buddhist denotes by the word "Nirvana" and the Hindu by the words "the Atman that is Brahman without differences." I shall try to direct your attention to this immediately experienced factor in radically empirically known nature and human nature as concretely as I can. It can only be pointed at by words; it cannot be literally said.

First, we must attempt, as far as possible, to remove all speculative theory from our minds and to concentrate attention on what we immediately apprehend, without any inferences beyond that immediacy either to underlying substances of any kind or to the imageless determinate constructs of mathematical physics or contractual law to which we referred at the outset of this paper. We note, as did Hume, the Greek Sophists, and the aforementioned ancient Asians, that in the realm of directly observed or experienced fact any item of inspection which is different from any other is temporal and perishes. As Professor Takakasu said at the beginning of his lengthy course on Buddhism in Honolulu in 1939, Buddhism begins with the directly observable, empirical fact that all such directly observed, determinate things are transitory. A determinate thing is any factor of fact that is different from any other, after the manner in which a color is different from a sound, a blue color from a yellow one, etc.

So far as knowledge warranted solely radically empirically by observation is concerned, this thesis is true. Anyone can test it for himself. St. Paul gave expression to this thesis when he said that the things which are seen, meaning thereby determinate things, are temporal; they all perish. I have at a given moment a specific set of images. I can observe determinate things only with my senses. The objects of each of one's senses are not persisting substances, but successive, perishing images. From moment to moment these images change, the present ones perishing to be succeeded by a different, similarly perishing set. The same is true of the data denoted by the word "self" as given introspectively. This, as William James noted, is a succession of perishing moods and feelings, rarely twice the same. I am elated at one moment and dejected at another. Moreover, the self is as relative to the perishing images which entice attention as the images are relative to the perceiver. As William James put it, a man is what he interests himself in, the stock market, his golf game, abstract art, or what have you. The Buddhist Burmese give expression to this fact and belief by assigning a different name to a person in his religious interests from the name which he carries during his secular concerns.[1]

This relativistic and perpetually perishing character of our directly experienced images and selves generates the second thesis of Buddhism: because all determinate things perish, all determinate creatures, both human and nonhuman, are doomed to suffer. This is a plain empirical fact of existence, since every differentiated thing we interest ourselves in, work for, cherish and love perishes.

But this is not all. The American philosopher and psychologist, William James, went one step beyond Hume in noting, as did the aforementioned Asians, that in the

[1] Win, Khin Maung, "The Psychology of the Burmese Language," *Main Currents*, Vol. 16, No. 5, May 1960, pp. 110-114. This essay shows also that the thinking and syntax of the Burmese language are not that of Aryan prose.

realm of purely factual, radical empirical immediacy there is one factor that does not perish. This is the all-embracing continuum of immediacy within which the many-termed relational perishing particular images of both the so-called inner and outer senses come and go. James expressed this as follows: It is only the portion of our radical empirical experience which is in the focus of attention that is sharply differentiated into successive perishing particular images; the periphery of radical empirical immediacy is vague and indeterminate. James noted also that religious experience derives more from this indeterminate and undifferentiated peripheral factor of immediate fact than from the perishing, imageful sensed particulars.

Within this account of the totality of radically empirical immediate experience, the Buddha's cure for the fact of determinate human suffering becomes meaningful. Were one's cosmic and psychical emotive experience and consciousness wholly determinate, after the manner of Hume, the fact of one's perishing and its attendant suffering would be the end of the story. The radically empirically informed Buddhist, similar to James, points out that each one of us is not only his transitory, radically empirical, perishing particular self, who may be a Mr. Jekyl at one moment and a Mr. Hyde at the next, but is also the cosmically all-embracing, indeterminate ocean-consciousness "without differences" within which these perishing particulars come and go. To cultivate, by radically empirical meditative and other means, the experience of this timeless, undifferentiated consciousness is to gain the equanimity and the unperturbable blissfulness from the standpoint of which one can view the pleasures and the sufferings of one's perishing particular differentiated self with equanimity. To do so is to achieve the Buddhist solution of the problem of suffering.

With respect to the radically empirical, differentiated perishing particular part of ourselves, all persons are different; with regard to the undifferentiated cosmic field component of ourselves, we are identical, not merely with one another, but also with the Divine consciousness. In Buddhism, therefore, as in its equivalent nondualistic Vedantic Hinduism, it is not a heresy to say "I am God," as it is in any of the three theistic Semitic religions.

What grounds are there for thinking that this radically empirical, descriptive account is thus at once both empirically true for radically empirically experienced fact and an immanent philosophy of religion? An examination of the usages of the words "religion" and "divine" shows that they may be viewed as but terms to denote those factors in empirically verifiable [illegible] which are timeless. In the merely radical empirical component, the purely factual, noninferential part of knowledge, only one factor is timeless, namely, the immediately experienced, all-embracing, undifferentiated continuum of immediacy within which all differentiations come and go. It is, therefore, appropriately identified with the Divine.[2]

What reason is there for supposing that this holds true for anyone? The reason is that the radically empirical undifferentiated can never be defined away in terms of anything determinate and differentiated; the undifferentiated must, therefore, be taken as a primitive.

There is a second reason born of the experience of modern scientists and philosophers. One of the outstanding contemporary mathematical physicists, Schrödinger, a creator of the mathematics of quantum mechanics, writes to the following effect in his important little book, *What Is Life?* After noting that the theory of the pluralization of minds, which breaks consciousness into local atomistic mental substances, or Leibnizian monads, leads to the invention of souls, as many as there are bodies, and thereby generates the aforedescribed insoluble body-mind problem, Schrödinger concludes that the alternative is simply to keep to the immediate experience that "consciousness is a singular."[3] This is to accept the Buddhist-nondualistic Vedantic theory. In fact, Schrödinger in his later book explicitly refers to the profound effect which these Oriental philosophies have had upon his thinking.

Such is the classically Oriental factor in the present wedding of the world's cultures. We conclude, therefore, that just as there is the aforedescribed world-embracing transformation of the beliefs and customs everywhere by the construct thinking of Western mathematical physics and its technology and Stoic Roman and modern liberal democratic normative contractual law, so the Western conception of radically empirical immediacy and both the human and the divine consciousness is moving toward and being deeply and profoundly influenced by the classical ideas of Buddhist and nondualistic Vedantic Hindu Asia. The same is true, as Professor Gardner Murphy's recent paper in *Main Currents*[4] shows, of contemporary psychiatry. A correlary is that, when the radically empirical and the construct thinking parts of cosmic and human nature are correlated, humanistic normative, moral, legal, aesthetic and religious man and scientific man become one and the same person.

[2] However, the component of the Divine which results is that of Buddhist and nondualistic Vedantic Hindu Oriental religion; it is not that of any one of the three Semitic religions. To have a meaningful theory of the latter, logically realistic construct thinking is necessary. For this component of an adequate contemporary philosophy of the world's religion, see the last chapters of the writer's *Man, Nature and God*, Simon and Schuster, New York, 1962.

[3] Schrödinger, Erwin, *What Is Life?*, Macmillan, New York, 1946, pp. 89-90.

[4] Vol. 21, No. 4, March-April 1965.

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The Law Beyond the Law

A DISCUSSION OF THE RELATIONSHIP BETWEEN ETHICS AND THE LAW

IN CIVILIZED LIFE, Law floats in a sea of Ethics. Each is indispensable to civilization. Without Law, we should be at the mercy of the least scrupulous; without Ethics, Law could not exist. Without ethical consciousness in most people, lawlessness would be rampant. Yet without Law, civilization could not exist, for there are always people who, in the conflict of human interest, ignore their responsibility to their fellow man.

From the beginning, men discovered, even before they could articulate the principle, that material goods are finite and the desire for them is infinite. This inevitably led to conflict. Sometimes, such conflict occurred within the family, or clan, or tribe. Cain murdered Abel for a slight so insignificant that the Bible does not even record it. He was subject to punishment, for he had killed his own brother. In primitive life, if he had slain the member of another family, or clan, or tribe (depending on the degree of civilization), he would not have been punished, and his deed would not have been considered wrong by his relatives or clansmen or tribesmen. Law and Ethics, which in primitive life were identical, protected only those within a limited group. In general, they offered little protection to outsiders. If a member of a group killed an outsider, the outside group felt it its duty to avenge the murder. This was a matter of Law. The principle of the blood feud was a recognized institution in the early history of mankind, and survived even in parts of pioneering America. A person who injured a member of an outside group, whether family, clan or tribe, subjected himself to punishment by one of its members. If he could not be located, some other member of his group might suffer in his stead. This was considered not wrong, but right, not illegal, but legal.

The principle of the blood feud has been resurrected in our own times by gangsters who take the law into their own hands. It was also resurrected by Hitler, who was a special sort of gangster, and would sometimes wipe out whole villages to avenge the death of a member of the "master race" at the hands of a villager who could not be located.

Ultimately, as tribes merged into nation-states, the principle that violence —also in times of peace—is punishable by Law, has been accepted the world over by civilized communities. No longer does injury to one's fellow require or justify vengeance by a relative of the injured. It requires action by the District Attorney, representing the public at large. The slaying or injuring of any

person is considered an insult to the majesty of the State, and the State must do its best to suppress such a tendency, no matter how unworthy the victim, no matter how great the injury. From time to time, people, husbands and wives, have appealed to a so-called Unwritten Law, giving an injured spouse the right to take vengeance on the person breaking up a family; but this exception, while eliciting sympathy, has no justification in the Law of the Land, or indeed in Ethics. Wrongs, no matter how grave, have their remedy in the courts, if they are sufficiently serious and sufficiently clear. If they cannot be proven to the satisfaction of an impartial judge or jury, they cannot be punished either by the community or by the individual who considers himself wronged.

The Ship of State, represented by the Law, would begin to leak, and ultimately sink, if it permitted taking the Law into one's own hands and obeying what one considered a moral command to avenge injustice to his brother. Where Law asserts its authority, Ethics must accept its dictates. It cannot be right, any more than it is legal, to lynch a person without trial, to steal from a thief, to return injury for injury.

On the other hand, without ethical understanding, the Law, as a Ship of State, would be stranded on dry land. Where there is no ethical commitment to observe the Law, the judicial and police systems are really helpless, and Law often ceases to operate at all. Therefore, the genius of the civilized world, particularly of the English-speaking peoples, has made obedience to Law and acceptance of decisions of duly authorized agents of the community, whether legislative or juridical, mandatory as an ethical principle. This principle applies alike to majority and minority interests and groups.

Men defeated for office, frequently by a small margin of votes, accept the decision of the electorate as binding on them. Even when they consider such decisions perilous to the community, they do not pit their judgment against the majority, knowing full well that no danger to the State can be as great as the danger of lawlessness and chaos. Even the armed forces, in advanced countries, submit to the decisions of unarmed civilians as a matter of course, recognizing that the will of the majority as expressed through Law and the Constitution under which the State operates, is the very foundation on which Society rests, providing security far more important than vindication in any specific issue.

Under our Constitution, with its system of checks and balances, the three great departments of government, the Legislative, the Executive and the Judiciary, are each bound by oath to support the basic law of the land and to avoid encroachment on the prerogatives of one another. Such restraint could not be enforced in the absence of Ethics. The use of force by one of the divisions of our Government against the other would itself violate the Constitutional provision of the separation of functions. The restraint is therefore a moral obligation, deriving from the oath of office, taken by every official of the government to uphold the Constitution. So fully have the people recognized the significance of this ethical concept, that even the semblance of a violation of the spirit of the Constitution in this regard has been generally condemned throughout our history. It has become ingrained in our Law and is really the genius of our institution.

But we are also sometimes painfully aware of the inability of Law to solve problems of Ethics. A ship is not a sea; and there are innumerable facets of our lives with which the Law cannot possibly deal. We learned the danger of trying to confuse what the people consider the realm of Ethics with what they consider the realm of Law in the bitter school of experience, during the era of Prohibition. An amendment to the Constitution of the United States, and the laws passed under it, were greatly resented by a large proportion of our people, perhaps the majority, as an invasion of private judgment by the Nation. They felt that the amendment itself, and the laws passed under it, constituted an effort to use the machinery of the Nation to compel obedience in an area of private life, where persuasion alone was indicated. After a number of years, we found that taking the issue of alcoholism out of the area of Ethics and placing it in the area of government—instead of curbing the use of alcohol (which the effort did not succeed in doing), led otherwise law-abiding citizens to violate the law. The morals of the community were also being undermined in other areas than alcoholism itself. There arose a system of underworld organizations, leading to the spread of crime, with dire effects felt even to this day. Respect for Law was undermined because Law had tried to deal with a problem which in the modern world is considered one of Ethics; and being undermined in part, tended to be undermined as a whole.

Not everything which is wrong can be outlawed, although everything which is outlawed, is, in our Western conception, wrong. For many years, legislatures and courts have endeavored to define for corporate and Government officials what constitutes a conflict between their public responsibilities and their private interests. None has yet been able to state in legal terms rules that will at the same time afford both freedom of dynamic action by the individual and protection of the public interest. Every law designed for such a purpose has presumed and I assume must necessarily presume that such laws cannot be effective unless there is Law behind the Law; i.e., an ethical concept on the part of all who accept public responsibilities.

In the complexities of civilized life, we cannot, even in time of war, undertake to guide each individual in his moral decisions. Indeed, we feel that we should not. One of the purposes of civilized society is to produce men capable of making righteous decisions and adhering to them. To compel obedience in all areas of life would be to reduce men to automata, incapable of making their own moral decisions and defeating the very purpose of civilization itself.

We need Law to guide us in areas properly subject to it. We decide through legal procedures, legislative, executive and judicial, how we should conduct ourselves in the vast areas of life subject to the scrutiny and power of Society. A father may decide how his inheritance is to be divided among his children, and the courts will generally enforce his will. But the courts cannot compel his children to love one another, or even to behave as though they did. If courts could compel love, there would never be divorce. If courts could compel friendship, there would hardly be any litigation. If courts could compel mercy, many of the evils of our life would cease to exist.

It is even more difficult for courts to deal with problems which are utterly private. There is no way in which the legislature can outlaw selfishness or greed, or avarice, or cowardice, except in a few particularly gross manifestations. Law may require all of us to be vaccinated against some diseases, especially when we are threatened by an epidemic; but in general, it has no way of controlling habits, even those inevitably leading to disease.

Therefore, Society would come to grief without Ethics, which is unenforceable in the courts, and cannot be made part of Law. If there were no sense of love in families, if there were no sense of loyalty, if friendship meant nothing, if we all, or any large proportion of us were motivated only by avarice and greed, Society would collapse almost as completely as though it lacked Law. Not only does Law in civilized society presuppose ethical commitment; it presupposes the existence of a broad area of human conduct controlled only by ethical norms and not subject to Law at all.

There is thus a Law beyond the Law, as binding on those of us who cherish our institutions as the Law itself, although there is no human power to enforce it. Our economy rests to a great extent on the mutual faith of seller and vendor, which implies far more than the courts can possibly enforce. We enter a store and are offered an article at a certain price. In primitive communities, it is not possible for the purchaser to know whether the price is fair or not. To assure himself of fair dealing, the consumer must resort to a long process of bargaining, even over trivial objects. In civilized communities, such bargaining is limited to purchases which are distinctive and of large concern, like that of a house. But if one buys a necktie, one simply assumes that the prices stated by the vendor are fair ones for the object, and one pays it.

In the Law beyond the Law, which calls upon us to be fair in business, where the Law cannot command fairness; which bids us temper justice with mercy, where the Law can only enforce justice; which demands our compassion for the unfortunate, although the Law can only give him his legal due, each of us is necessarily his own Chief Justice. In fact, he is the whole Supreme Court, from which there lies no appeal. The individual citizen may engage in practices which, on the advice of counsel, he believes strictly within the letter of the Law, but which he also knows from his own conscience are outside the bounds of propriety and the right. Thus, when he engages in such practices, he does so not at his own peril—as when he violates the Law—but at peril to the structure of civilization, involving greater stakes than any possible peril to himself.

This Law beyond the Law, as distinct from Law, is the creation of civilization and is indispensable to it. Unknown to primitive societies, except to the extent that it is identified with the Law itself, it has been transmitted from generation to generation in the family, in the school, in the great religious traditions and philosophies of the world.

The existence of this Law beyond the Law places heavy responsibilities on the individual. It is he who has to apply it in difficult and perplexing situations. This necessity requires him to be trained in the discernment of right from wrong and in the will to accept the right, without the slightest duress. His problem is the more complicated because the issues presented by life are rarely simple. The individual usually has no difficulty in discerning absolute wrong from absolute right, just as the Supreme Court would never be divided in its opinions if in a particular case only one constitutional principle were involved. It divides very frequently, because in actual cases, several constitutional principles are involved, and their implications, so far as these cases are concerned, are by no means the same. Similarly, the individual, confronted with life's problems, has to evaluate the relevance of one value or precept against another, insofar as both concern the immediate situation. No wonder that he is frequently perplexed; and wishes he could free himself from the obligation to follow the Law beyond the Law.

This ability properly to appraise different values in their relevance to specific issues, we call character. A person able to discern the right in the midst of great confusion and to pursue it, is a person of character. A person may be learned or ignorant; he may be old or young, rich or poor, well or sick; whatever his condition, he has to act, and his actions have their effect on himself and generally also on his fellow men. The man of character, sensitive to the meaning of what he is doing, will know how to discover the ethical path in the maze of possible behavior.

The importance attaching to educating men of character has been beautifully dramatized by the foremost of our poets in a series of plays which have become immortal. In his great tragedies, which after the lapse of three centuries still command our interest and admiration, Shakespeare, with great compassion for the sad lot of man, illustrated how failure of character can lead to personal ruin and widespread catastrophe.

Brutus, as his adversary testified, was an honorable man. But as Shakespeare saw him, he had what Napoleon, himself no paragon of virtue, but in some respects a wise man, recognized as the most fatal defect of all—the inability to know his own limitations. Without imagination, he identified the Rome of his day with that of his famous ancestor

who had defied the early kings of Rome, and Caesar with those kings. The great changes which had occurred since those early days in the responsibilities of Rome and her power apparently seemed to him negligible. He believed that by emulating his distinguished ancestor, he could perform for his own time the service which the earlier Brutus had performed for his community. But it was not so. A new world had developed; and if Caesar was wrong in trying to establish a dictatorship, Brutus was likewise morally obtuse in trying to preserve an outworn oligarchy calling itself a Republic. The moral problems of Rome in his time arose from her world power; and had to be resolved not by return to the past, but by imaginative planning for the future. Of this Brutus was incapable. Error led to error; his agreement to murder Caesar led to a revulsion of conscience in which he spared Antony whom he allowed to speak at Caesar's funeral, and who inflamed the people against Brutus and the conspirators. War ensued; and Brutus had no alternative but to die at his own hands.

Hamlet represents a totally different type of person, but with equally astonishing defects of character, despite his nobility and attractiveness. Hamlet finds it almost impossible to resolve his moral dilemmas. Seeking guidance in sheer intellectual brilliance, he finds the problems presented by life almost incapable of solution. In his despair, he turns from intellect to impulse, murdering the innocent Polonius and driving his beloved Ophelia to insanity. When he ultimately decides that he must slay his uncle, he slays a whole series of other people, including himself, with him.

Macbeth is a loyal and brave warrior, whom, however, the apparition of witches is able to transform, together with his wife, into rebels and regicides. His loyalty and devotion to his King is a ritual, unable to withstand the onslaught of the passion for power. One murder leads to others; rebellion leads to tyranny, and ultimately, Macbeth, who might have ended his life honorably, dies disgraced and heartbroken.

King Lear, perhaps the most tragic figure of all, wants to be loved and wants to be sure that he is loved. He wishes to bequeath his kingdom not according to the love he feels, but according to the love he persuades himself he receives. And in the quest for certainty of being loved—a quest necessarily vain—he disinherits the daughter who loves him most.

Although these characters differ markedly from one another, they have several traits in common, leading to their disasters. All of them share a certain naïveté in the affairs of life. None of them is really moved by compassion for individual human suffering and weakness. Three are moved to commit murder, and the fourth to the banishment of his youngest child. Shakespeare seems to be telling us that wisdom and compassion are indispensable ingredients of character and are basic to any true Ethics. Compassion may not be adequate. To pity a child in such a way as not to wake him in time for school, is to hurt, not to help him. To indulge a weak person in his weakness, is to do him a disservice. There is need for compassion beyond compassion, as there is need for Law beyond Law. But we cannot dispense with sheer compassion if we desire to achieve right decisions.

The four tragic Shakespearean characters have another fatal quality in common. They all reach their disastrous decisions without consultation.

Shakespeare seems to be telling us that none of us is so perfect as to be able to rely solely on his individual judgment in moral issues, especially those which involve his deepest emotions. Compassion would have saved each of these characters from the harsh action he took; but doubtless so would consultation with people of high integrity, not personally involved in the problems.

The need for consultation is a recognized principle of legal procedure.

The Court over which I have the honor to preside would be a different court not only in wisdom, but also in character, if it consisted of only one person. Even in the Law, where the issues are often less complicated than in our daily lives, each of us, participating in final authority, needs the frank and independent criticism of his peers. In our Court, any member may be outvoted, but no one is outvoted until after consultation and reflection upon the competing values involved in the problem to be solved. Likewise, in the areas in which each of us is his own court, so to speak, in the Law beyond the Law, one must be prepared to be outvoted after taking counsel with his better instincts and to accept graciously the minority status that follows.

We all know the importance of consulting a physician about our physical health. Is our moral health any less important? In one area of life, such moral counseling has been introduced with very significant results—namely, that of marriage. The profession of the marriage counselor has achieved recognition and even distinction, and is doubtless responsible for the preservation of many families, which might otherwise have been broken.

But the business executive, the labor leader, the academician, the politician—needs counsel as to what is right no less than the husband and the wife. Our chairman, Judge Rifkind, is quoted as remarking that frequently when new business ventures are undertaken, all kinds of experts are present—except for one expert—the expert in Ethics, who can suggest whether the whole plan as conceived was socially useful, was right, was appropriate under the circumstances.

It would require quite a revolution in our way of thinking for each industry to invite an expert in Ethics to sit on its Board and to participate in its deliberations; for each Trade Union to have such an expert advise it with regard to its responsibilities to the general community, as well as to its own members, and to advise its officers regarding their responsibility for the men under their guidance. Our college campuses might look very different if such prob-

lems as the promotion of faculty members, and the enlargement and functioning of the school itself were subject to deliberation on moral grounds. And our political campaigns, our nominations and elections might well be different, if political parties included experts in Ethics among those deciding policies.

Is it fantastic to suggest that there is an urgent need in our troubled times for the development of the profession of the counselor in Ethics, having the same relation to inter-personal conduct, beyond the Law, that the lawyer has to conduct that is subject to the review in the courts? The developments of this century indicate that this need is no fantasy at all. Until this century, the world had never heard of marriage counselors or of psychoanalysts. Yet the value of each calling has been demonstrated. The search for Ethics has been pursued since ancient times. Is it not obvious that all of us need Ethics counselors?

Such counselors in Ethics might well include the ministers of all faiths, if they were trained to serve in the capacity required of them by a changing world. Knowledge of the great traditions of Ethics would certainly help an Ethics counselor, no less than knowledge of legal precedent helps a lawyer, trying a case which is really without precise precedent. But in the contemporary world, ethics counselors might have to include other people than ministers, as well. I can conceive also of lay scholars who, having mastered the ethical thought of the ages and spent much time in the study of the modern world and its problems, could helpfully suggest courses of action and alternatives which might prove helpful to the modern business man, politician, academic executive and other professionals who wish to discern the right. I can conceive of a school dedicated to the purpose of training such professionals, becoming the center of research in the field of moral standards, trying to resuscitate the glories of Aristotle, of Maimonides, of St. Thomas Aquinas and of Spinoza; and yet different from their ways of research in its concern with concrete problems of conduct, and training people to help themselves and to help others solve concrete issues of personal behavior. The education of both ministers of religion and of lay specialists, qualified to help the confused find himself in the maze of ethical problems is, in my opinion, one of the urgent needs of western democracy, as it attempts to preserve its tradition of freedom in competition with rival systems of life, where once more, as in primitive life, all right conduct is dictated by Law.

The business man, the labor leader, the politician or the college executive may fear that with such an ethics counselor at his elbow, he might be discouraged from undertakings he has much at heart. But what in fact is the alternative to such discouragement of what is contrary to the public good, or the long range good of mankind, or to simple compassion for the individual? Is it to proceed headlong as we are proceeding now, deifying Success as the sole goal in life, and constantly putting greater emphasis on quantity rather than on quality in what we achieve? And if we proceed in this manner, is it not obvious that within a reasonable time—not too long—the whole world, emulating us Americans, even if it does not love us, will adopt the very standards which we have adopted? And when that happens, will it not turn out that we, like Brutus, Hamlet, Macbeth and King Lear, have brought on ourselves quite avoidable disaster?

It happens that at this climax of history, our country stands at the apex of world power, of world resources, of world wealth and of world influence. This is a great privilege, but it is a privilege carrying with it enormous responsibility. The responsibility which is ours is to stimulate mankind to conduct its affairs with wisdom, with conscientiousness, with a view to the future, with an understanding of the public need, with a view to the long range perspectives of history, and above all, with great compassion for the individual.

The situation would be hopeless indeed if every village did not have its houses of worship, guided by ministers of the various faiths. These ministers are kept busy in our communities with various functions, all of them useful. They minister to the sick and the dying; they help the needy; they move us to recognize the greatness of our Creator and urge us to find a way to righteousness.

They are overburdened men. And yet the times require these dedicated servants of God to take on even another burden and willingly to share with others, not necessarily ordained, the task of analyzing the problems of the individual in the modern world. The seminaries in which ministers are trained need to prepare them for this service to the individual in the community, and they need to find a way to win the faith of the community leaders in industry and the professions in the guidance which they have to offer.

I believe that the Herbert H. Lehman Institute of Ethics, established at your Seminary, and named for one of the truly eminent figures of our country and our time, can serve as a pilot project, in which to train such ethics counselors for men of your own faith, and through their example to stimulate the development of similar centers in other traditions. I do not regard the word of Scripture as a dead letter, addressed only to the generations who heard it from the mouths of the Prophets. I regard the Scriptures as a living tradition, as applicable in our time as in any other. But in a changing world, this word needs new interpreters, adventuresome spirits, able to make it effective in our lives.

If this task of making moral decisions a guide in our lives can be accomplished in our generation, we will have taken a giant step toward bringing ourselves closer to the ideal to which men have been striving since the origin of the species. We will also, I believe, be doing much to prevent the moral decay of our community, a decay similar to that which has proven fatal to all earlier great empires and civilizations.

Wisdom and compassion are the indispensable ingredi-

ents of moral decision. We are all born compassionate, although as we grow older, we sometimes permit what we believe is practical to blind us to our innate mercy. Wisdom has to be acquired. It may be acquired in the family, in the school, in the church and synagogue, and in other institutions which civilization has created for that purpose. But there comes a time when the wisest of men finds himself confused, because as it is difficult for a client to serve as his own attorney, for a patient to be his own physician, so it is sometimes difficult for even the wisest and most learned of men to be his own counselor in Ethics. The recognition that this role properly belongs to ministers of religion and is one of their gravest responsibilities, and that to carry out this responsibility in a changing world with innumerable problems, they may have themselves to seek guidance from experts in fields other than their own, may turn out to be indispensable to our civilization.

Our Constitution has guided our country for almost two centuries in a manner which might have surprised even its framers. It certainly has surprised many critical observers. A study of this Constitution reveals that it is permeated by the two qualities I have mentioned—wisdom and compassion. Wisdom and compassion also characterized the foremost of our statesmen, Abraham Lincoln, who has proven to be such an inspiration the world over.

In these examples, taken from the history of our Nation, we can find a guide to help each of us in his individual decision. We need compassion; we need wisdom. In perplexity, when temptation turns us away from either or both, we need reliance on a guide who will remind us of their relevance to our lives, of their importance to ourselves as individuals, and because of our unique role in the history of our time, to the world which is emerging about us.

The foregoing address was delivered at the annual Louis Marshall Award Dinner of The Jewish Theological Seminar of America, held on November 11, 1962 at the Americana Hotel in New York City. Chief Justice Warren was the guest of honor at the dinner, which followed an all day colloquy on ethical and legal problems at the Seminar.

The day's program was part of the Seminar's endeavor to interpret Judaism to the contemporary world, and to clarify those moral and spiritual values which are the common heritage of all mankind. At the colloquy, this effort took the form of discussion of certain moral dilemmas of our time, with members of the Seminary faculty, rabbis, jurists, scholars, and men of affairs participating, as well as the Chief Justice.

JEAN-MARC SAMSON

The Emerging Significance of Sexuality in the Contemporary World

THE "SEXUAL REVOLUTION" IS NOW YIELDING TO A LARGER CONCEPT OF SEXUAL CREATIVITY

THROUGHOUT MAN'S HISTORY, sexuality has been used as an element of social control. Primitive societies, as well as more advanced ones, have almost always transformed sexuality into a demagogic tool, something of service in their search for survival. Nevertheless, today's society differs in a significant way: Perhaps for the first time in history, humanity is insisting more upon the idiosyncratic character of sexuality than upon its social efficiency. The so-called "sexual revolution" represents merely the first phase of this cultural transformation, and there are more profound issues still to be faced. The preliminary phase of "sexual apologetics" is now over. The exploration of the approaching phase of "sexual creativity" has to be undertaken.

Looking backward, one perceives a subdued sexuality, in thrall and servitude to the social collectivity. The understanding of this situation may be easier if one remembers that societies cannot exist unless there is a sufficient degree of homogeneity among their members. The survival of a group as a group rests upon a certain level of uniformity among its individuals.

It is from this perspective that one should study the place given to sexuality in the societies of yesterday. A sexual ideology was established by every society; the goal of such an ideology was to contribute to the social cohesion. The same goal existed for the official religions, and certainly for other social institutions.

Nevertheless, sexual and religious orthodoxies offered advantages over other factors; both of them touched individual life at the core (soul and body), but neither overtly presented itself as a means of socialization. This last characteristic was of the utmost importance, for if the real usefulness of these orthodoxies had been unveiled, the citizen might have been led to revolt against them, and so have contributed to the destruction of the social group.

Thus, less concerned with the happiness of the individual, the sexual ideology (and its immediate effect, the sexual homogeneity) serves as a factor in group survival, indeed a most important factor.[1] Sexual norms, such as incest prohibition, endogamy, exogamy, patri- or matrilinearity, primacy of procreation, denial or glorification of sexual pleasure, etc., should be considered in this perspective, as a means to maintain the group as a group. This idea has been developed by many, especially by Lévi-Strauss.[2]

The specific case of virginity may be understood in this context. The fact that the nubile girl must jealously protect her virginity, is primarily a "lever" used by a patrilinear society to insure its survival.[3] Since the risk of bastardy would

otherwise be great, virginity becomes, for the husband, the sole guarantee of his fathership. Except where the use of such devices as the chastity belt was customary, the eldest offspring has been favored, since in the case of the cadet or of the youngest, the assurance of fathership is not absolute. In such a context, the hymen acquires a social importance, and its loss—save in the marriage situation—is the equivalent of an act of sedition. Other societies, however, have promoted the opposite norm: among them, virginity was looked upon as a blemish that should be discarded before marriage; virginity on the wedding day was socially repulsive, and was also the equivalent of an act of sedition.

In both cases, the norm for or against premarital virginity served a sexual ideology aimed at the societal benefit: that is, social conformity.

In short, whether a society favors children's free sexual play—and even organizes it, as through the Ghotuls among the Muria[4]—or whether a society declares any sexual activity before marriage (and sometimes within marriage) to be a guilty act, the underlying motives remain the same: to assure that everyone acts and thinks sexually the way everybody else does and consequently, to instill a sexual homogeneity which is an essential element of survival as a group.

One can easily imagine the kind of dilemmas faced by these societies. Being intelligent people, and not mere automatons, citizens would ask for justifications of the sexual norms. A refined dialectic must preside over the answer: On the one hand, the process whereby the sexuality of individuals is controlled must remain tacitly accepted by the members of the group; on the other hand, a certain amount of justification has to be given to quiet the minds of the group members. To solve this dilemma, it has been the rule to justify sexual norms with so-called "natural" explanations, about which no doubts were permitted. The Occidental tradition, for instance, based the primacy of procreation upon the "biologic evidence." This tradition managed to severely limit the anti-social powers of sexual pleasure. Since pleasure (and sexual pleasure in particular) is by definition idiosyncratic, it has the possibility of enabling the individual to observe his *own* rule, and so may encourage social dysfunctionality. The easiest way to curtail the dangerous possibilities of sexual pleasure is to declare it unhealthy and damaging for the human being. Accordingly, sexual pleasure has been said to be capable of depriving the human being of his essential nature, of hindering the exercise of reason, and consequently, of degrading man to the pejorative level of "the beast."

This type of sexual education, which today would be called mis-education, was supported by organized religion. Under the signature of society, religious authority affixed its seal. Thus the sexual orthodoxy was "theologized"; and by the might of religious anathema, which no one dared oppose, it was assured of stability.

However, it was difficult, if not impossible, to repress the demoniac dynamism of sexuality completely. Periodical outlets were tolerated and, in some instance, institutionalized. Bacchus Day, Mardis-Gras, carnivals and many ritual orgies at least partially served this purpose. As for those who acted contrarily to the established norm—outside permitted times and places—it was sufficient that they should acquire the conviction that their behavior was mistaken or aberrant. Thus even the backslider was safeguarding the efficiency of the factors of social homogeneity: By publicly acknowledging his own faults, the "sinner" was given the chance to confirm the sexual orthodoxy; his self-punishment was a way of supporting and reinforcing the socially admitted norms.

For the most part, these processes have been unconsciously at work in society. It would be an oversimplification to suggest that such an organization of sexuality resulted from the deliberate decision of a high priest or a censor of whatever tyrant. One might better speak of the group self-idealization as the underlying cause and unconscious force of this organization. It would be incomplete and misleading to declare that such a development has its origin in the *nature of things*, but one may venture to say that it does arise out of the form of consciousness and organic growth of a society.

In short, our glance backward reveals a controlled, even an enslaved, sexuality, subdued to the State policy. Sexual taboos have acted as a spider's net; they have entrapped individuals, and made improbable—or even impossible—their access to autonomy. One might think that everything had been planned so that the question of sexual freedom would *never* be raised.

A Fractured Homogeneity

Everything had been planned . . . or almost. From 1850 to about 1940, however, sexual orthodoxy was strongly shaken. The developing sciences of biology and psychology, aided by the growth of rapid communication, began to call the sexual ideology into question.

For the last 150 years, biological discoveries have progressed at a tremendous rate. The microscope and the advance of experimental embryology permitted a more precise and accurate understanding of human anatomy and developmental physiology. It has thus been impossible to keep on defending the *homunculus*, even though this theory served to support the interdiction of masturbation. The evidence of the biologists was irrefutable: spermatozoids were not "small men," and so masturbation could no longer be labeled a horrible crime. Thus, in its discoveries, biology came to contest the rationalizations of the system: in its own way, biology undermined the justification of the functions assigned to sexuality in the West.

Similarly, from its very beginnings, psychoanalytic theory also helped to loosen the strait jacket imposed upon human sexuality. Freud and his disciples broke the tradition of what Teilhard de Chardin called "moral eunuchism."[5] The reaction was quite violent. Feeling threatened, the system did all it could to categorize as "immoral" any

attempt to liberate human sexuality. Counterreacting in the same mood, many "analysts" over-insisted on the importance of sexuality for the human being. Many of them developed a sexual messianism which had the effect of confirming the rigidity of the old sexual orthodoxy.

In the field of communications, the "Spirit of St. Louis" opened the era of "encounter." Since then, the world has slowly transformed itself into a "global village."[6] Instant communication has brought cultures close together and, nowadays, we are constantly listening to and watching the whole world. Occidental sexual orthodoxy was undermined by widespread awareness of other sexual systems. The luxury of a homogeneous and coherent system was vanishing.

Thus, by various means, occidental tradition, which has declared truth to be *one*—and that one its own—has slowly become convinced that truth is a pluralistic concept.

The Sexual Revolution

The rules of the game were therefore opened to revision. Choice between a restoration or a reform of sexual mores was forecast. Although reform was chosen, it has been called a "revolution."

Freud has written that civilization was based upon sexual repression. Distorting the meaning of Freud's concept of *libido* (at least as this concept was presented in his early writings),[7] Wilhelm Reich held that "sexual energy was the constitutive energy of the psychic organization," and that it was the "vital energy *per se*."[8] Faithful to his Marxist ideology, Reich also strove hard to "politicize" sexuality; his goal was "to harmonize the depth psychology of Freud with the economic and politic theory of Marx."[9] Sexual revolution, as proposed by Reich and his followers, was considered a *machina ultima*, capable of giving birth to the ideal proposed by Lenin: "the struggle against every economic, politic, social and national oppression."[10] Reich's perspectives were and still are adopted by many.[11] Ashley Montagu, for instance, writes: "The sexual revolution should precipitate the educational revolution which should in turn swiftly lead to the human revolution."[12] If one admits that the human being's fundamental energy is libido, one is logically forced to accept that "those who are free in the libido will understand the true nature of reality and can no longer be defrauded by the System's manipulative myths."[13]

But the motives that supported the necessity of sexual revolution crumble more and more every day. Individual psychology, social psychology and ego-psychology, along with the interpersonal movement, have shown that the libido does not constitute the whole of human energy. The theory that equated libido to human energy *per se* was recently denounced as a sexual myth by Leon Salzman.[14] Libido is said to be more an effect than a cause;[15] moreover, the capacity to receive and to give *love* seems to be a much more fundamental human "activity" than is libido.[16]

Even if one considers the integration of sexuality as a contribution to the humanization of the human being, the too easy equation between sexualization and humanization, and between the sexual and the human revolution, is very doubtful. To my mind, any individual who says today that "revolution will be sexual or it will not be at all"[17] shows clear signs of age—of a point of view now outmoded.

Moreover, the uniformity of our fellow citizens can no longer be determined either on sexual or on religious grounds, as heretofore. Our technocratic and technologic society makes certain the inner orientation and social fidelity of its members by other constraints. The persuasive suggestion now is that work and leisure provide the preferential occasions for human maturation, and constitute the new "lever" to maintain group cohesion. Working, producing/consuming and relaxing are today the over-stressed stereotypes in our quasi-post-industrial culture. At present, these stereotyped *facons de faire* assure the cohesion of our society. Thus, having lost their societal usefulness, religious and sexual orthodoxies are no longer essential and may collapse; this is the situation in which we are living today. Even in its laws, Western societies now accept many of those that yesterday were ranked as sex criminals. However, our society cannot permit the *new* orthodoxies to be questioned. Society's objection to the hippy is not because of his unbridled sexuality, but because of his supercilious attitude toward work. Today, to refuse to remain what Heidegger called a "beast of burden," to declare laziness and idleness worthwhile and pleasant, is interpreted as a denial of our culture; to oppose the conquest of the moon, to reject the stated value of products of scientific conquest, is equivalent to sedition. But, so far as sexuality is concerned, socially speaking at least, it has become a personal affair.

Thus, the sexual revolution has now been superceded. To promote the sexual revolution today, seems to me to denote attachment to the past, or delight in an easy narcissism. I am astonished to read appeals which still attempt to persuade us to "place sexual problems at the level of propaganda and agitation," and which even urge the "creation of an association to fight sexual repression."[18] This attitude, in today's context, seems to be more the result of an institutionalization of a form of revolution than of a wish to liberate sexuality.

To my mind, the "sexual revolution" is over, at least from a societal point of view.[19] Today, societies no longer desire to regulate sexuality. The citizen of the 70's is free to make love, or not to, as he wishes. His sexuality is his own affair, as long as he is willing to work hard, spend liberally, and enjoy his leisure to the fullest extent.

This point of view might be criticized as an overly optimistic attempt to fit reality to theory. Therefore, making a double distinction might clarify our purpose.

First it is true that many members of contemporary societies still *wish* to continue the sexual orthodoxy and to have it serve again as a lever of conformity. The recent recrudescence of censorship in France,[20] and the determina-

tion of many organizations to have it reinstalled in the United States[21] are in fact the last shots to be fired in a battle already won (or lost, depending on one's point of view). Scientific evidence now negates the theory that pornography automatically produces bad citizens. Even though many people may still want to believe that pornography is "inherently and purposefully subversive of civilization and its institutions,"[22] it has been found that pornography and obscenity are no longer socially relevant; they "are not public matters at all."[23] The same argument applies to other aspects of sexual behavior.

The second distinction we should like to point out is the dissociation of sexual freedom from sexual liberation. That sexuality is socially free does not mean that each and every person is free from the taboos that have for so long surrounded the subject. Shades of yesterday's sexual homogeneity continue to haunt our unconscious, and to influence our sexual attitudes and behaviors. Subjective and personal liberation—or recovery from alienation—remains to be worked out; during the 70's, men and women will have to fully realize their own sexual autonomy by reviewing the content of their own super-ego. With Jacques Mousseau, one may say: "They are free, yes, but liberated, no. Free to make love, but not free of the pressures of the inherited habits, of current customs and fashions, and of personal environmental demands upon the sexual desires."[24] A personal sexuality is still to be achieved.

Pitfalls

In his struggle to achieve a genuine personal sexuality, the individual of the 1970's will have to avoid three kinds of pitfalls: institutionalization of the sexual revolution; neo-orthodox sexuality; the delusion of a merely sexual humanism.

1. *Institutionalization of the Sexual Revolution*

Even though the confrontation between the individual and the system no longer rests on sexual grounds, the system's oligarchy will unconsciously try to persuade us that it is still so. There is a two-fold benefit in such a move: First, the energy and time expended by individuals in a contest already decided will not be available for a struggle against the existing and actual alienation imposed by spending-working-leisure. As long as the silent majority and the shrill minorities concern themselves about pornography, censorship, abortion and such matters, they forget the slavery of "nine to five," and do not devote their energies to controversial issues such as poverty, pollution and social inequity. Second, as long as citizens engage in a fight on sexual grounds, they help to conceal more profound problems; their actions create a strategy of diversion. Thus, the sexual combat becomes a screen to hide the effects of the actual "levers" of social control.

We are accustomed to consider the individual and his society as dialectic forces. In this perspective, the growth of one is founded on the deprivation of the other. However, to my mind, society and the individual should be looked upon not as dialectic, but as *dialogic* forces.[25] Society is essential to personal autonomy, and *vice versa*. But if a choice were forced upon me (and this is a personal choice), I should opt for the individual, since the autonomous person is capable of bringing to existence a new form of society, whereas the reverse has been shown historically not to be true. The autonomous person [26] is the only type of person capable of promoting interpersonal and empathic relations between individuals (that, in the long run, might create an empathic society).

2. *Neo-orthodox Sexuality*

In his well-known book, *The Secular City,* Harvey Cox discusses the effects of the new sexual freedom. Liberated from the ancient sexual burden, the citizen of today lacks a personal value system; he is facing a "value vacuum,"[27] a general sexual anomie. The mass media create an artificial image of man which, through commercial exploitation, is imposed on all, thus destroying human freedom. As Cox says: "Nowhere else are we in a need of a definitive exorcism!"[28] Although free from the old conformity, the individual of the 70's seems unable to grasp the idea that *his* sexuality is a manifestation of *his* selfhood. He has a tendency to subdue himself to the new tyrant: the sex-expert or the "sex-specialist." Having avoided the Charybdis of the sexual-social orthodoxy, he founders on the Scylla of the sexual-scientific orthodoxy. With a smile, he accepts the "new tyranny of sexual liberation."[29] Though appearing to be no longer a social robot, he uncritically accepts the new sexual dogma and is eager to be remodelled into a scientific automation, slave of the most recent postures and techniques invented by the "specialists." As in the case of tribal man, modern man seems unable to proceed to the relevant integration of his own personal sexual experience. The contemporary Clan (whose totems are provided by an object-minded science and celebrated in the mass media) fills up the void caused by his lack of a sense of personal direction and value. The individual joyfully accepts this new alienation, which might be called a neo-orthodox sexuality.

3. *The Delusion of a Merely Sexual Humanism*

The last pitfall is more subtle—one that is easy to stumble into and be entrapped by. Here, "the sexual experience [serves] to compensate for the aridity of most other experiences."[30] Sex becomes "compensatory,"[31] for it is considered as "the last sphere of truly private, intimate and non-mechanical activity left in a plastic-and-neon world."[32] In imitation of the Freudians (but for other motives) we try to entrust to sexuality *alone* the heavy task of enhancing personal identity. This phenomenon of canalization—which consists of satisfying a general need by a particular mode of satisfaction—cannot but result in a reduction of the whole personality to its sexual aspect.[33] Here, sex becomes once again messianic, believed to be

capable of answering *all* human expectations. Thus, "sex has become 'free' only to be fetishized in modern society as the only area of social life open to establishing fully human interpersonal relationships."[34] Making obeissance to this fetish, we "sexualize" objects, events, environment, individuals and all our interpersonal relations. One can speak justly here of "sexual consumerism."[35] Orgasm becomes the universal panacea; sexual encounter "in words, acts and thoughts," constitutes an easy poultice, postponing until old age (and sometimes later) the existential human issue: true interpersonal dialogue. To our mind, a purely sexual humanism constitutes a wide-spread delusion in contemporary America.

Sex educators, and scientific researchers into human sexuality, should be aware of the pitfalls into which they may unintentionally lead their audience. Exchanging the old "utility" placed over sexuality for a new one will certainly not lead to the autonomy of the human being, or contribute to the libération of the self. As has been done in the case of intelligence, emphasis should be placed upon the idiosyncratic, very personal character of human sexuality. Only thus can sex become a personal value, a resource to be considered and developed in terms of total human growth. Emphasis upon personal decision could then, hopefully, help people discover the meaning of their *own* sexuality.

This period of the history of human sexuality has hardly begun. If we are to enter upon a period of potential sexual creativity, our culture will not be helped greatly by a sex education which confines itself to the description of facts. Sex educators bear the responsibility to question their values and objectives,[36] and their own capacity to foster creativity. In this domain, as things stand at present, one is only allowed to hope.

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Line and Surface

LINEAR THINKING (WRITING) AND SURFACE THINKING (IMAGE-MAKING) ARE ENGAGED IN A CRITICAL CONFRONTATION WHICH COULD LEAD ON TO A NEW FORM OF CULTURE

SURFACES ARE BECOMING EVER MORE IMPORTANT in our surroundings. For instance, TV screens, posters, the pages of illustrated magazines. In the past, surfaces were rarer. Photographs, paintings, carpets, vitreaux, cave paintings, surrounded men in the past, but these surfaces did not offer themselves either in the quantity nor with the degree of importance of the surfaces that now surround us. Therefore, it was formerly not so urgent as it is today to try to understand the role surfaces play in human life. In the past, there existed another problem of far greater significance: to try to understand what lines meant. Ever since the "invention" of alphabetical writing (that is, ever since Western thought began to articulate itself), written lines surrounded men in a way that demanded explanation. It was clear: these lines meant the three-dimensional world in which we live, act and suffer. But how did they mean it?

We know the answers that have been given to this question, the most decisive for modern civilization being the Cartesian one. This affirms that lines are discourses of points, and that each point is a symbol of something out there in the world (a "concept"). Therefore, the lines represent the world by projecting it as a series of successions, in the form of a process. Western thought is "historical" in the sense that it conceives the world in lines, therefore as process. It can be no accident that historical feeling was first articulated by the Jews—the people of the book, i.e. of linear writing. But let us not exaggerate: only a very few knew how to read and write, and the illiterate masses distrusted (and *pour cause*) the linear historicity of the scribes and clerks who manipulated the civilization. The invention of the printing press vulgarized the alphabet, however, and it may be said that during the last hundred years or so the linear historical consciousness of Western man has formed the climate of our civilization.

This has now ceased to be the case. Written lines, although appearing even more frequently than before, are becoming less important than surfaces to the mass of people. (We need no prophets to tell us that the "one-dimensional man" is disappearing.) Now, what do these surfaces mean? That is the question. Of course, we may say that they mean the world, just as the lines do. But *how* do they mean it? Are they adequate to the world, and if so, how? And do they mean the "same" world that is conveyed by the written lines? The problem is to find out what adequation there is between

the surfaces and the world on the one hand, and between the surfaces and the lines on the other. It is no longer just a question of the adequation of thought to thing, but of thought expressed in surfaces on one hand, and thought expressed in lines on the other.

There are various difficulties to be encountered in merely stating the problem. One difficulty has to do with the fact that the problem can only be stated by writing it out in lines—therefore, in a way that begs the question. Another difficulty has to do with the fact that although thought which is expressed in surfaces now predominates in the world, this kind of thought is not quite so much aware of its own structure as is thought expressed in lines. (We do not have a two-dimensional logic comparable in rigor and elaboration with the linear Aristotelian logic.) And there are other difficulties which we cannot evade by saying, for instance, that thought expressed in surfaces is "synoptic" or "syncretic." Let us admit the difficulties, but let us try, nonetheless, to think about the problem.

Adequation of "Surface Thought" to "Line Thought"

To begin, we might put the following question: What is the difference between reading written lines and reading a picture? The answer is apparently quite simple: we follow the text of a line from left to right; we jump from line to line from above to below; we turn the pages from left to right. We look at a picture, instead, by passing our eyes over its surface in pathways vaguely suggested by the structure of the picture. The difference seems to be that in reading lines we follow a structure imposed upon us, whereas in reading pictures we move rather freely within a structure that has been proposed to us.

This is not a very good answer to our question, however. It suggests that both readings are linear (since paths are lines), and that the difference between the two has something to do with freedom. If we think about this more closely, we realize that this is not so. We may in fact read pictures in the way described, but we need not necessarily do so. We may seize the totality of the picture at a glance, so to speak, and then proceed to analyze it by means of the above-mentioned pathways. (And that, as a rule, is what happens.) In fact, this double method—synthesis followed by analysis (a process that may be repeated several times in the course of a single reading)—is what characterizes the reading of pictures. This gives us the following difference between reading written lines and pictures: we must follow the written text if we want to get at its message, but in pictures we may get the message first, and then try to de-compose it. And this points to the difference between the one-dimensional line and the two-dimensional surface: the one aims at getting somewhere; the other is there already, but may reveal how it got there. This difference is one of temporality, and involves the present, the past and the future.

It is obvious that both types of reading involve time—but is it the "same" time? It is so apparently, since we can measure the time involved in both readings in terms of minutes. But this simple fact makes us pause. How can we explain that the reading of written texts usually takes many more minutes than does the reading of pictures? Is the reading of pictures more tiresome, so that we have to stop sooner? Or are the messages transmitted by pictures themselves usually "shorter"? On the other hand, would it not be more sensible to say that the times involved in the two processes are different, and that their measurement in minutes fails to reveal this difference? If we accept this last statement, we may say that the reading of pictures takes less time because the moment in which their messages are received is denser; it is more compacted. It also opens up more quickly.

If, then, we call the time involved in reading written lines "historical time," we ought to call the time involved in reading pictures by a different name, because "history" has the sense of going somewhere, whereas while reading pictures we need go nowhere. The proof of this is simple: it takes many more minutes to describe what one has seen in a picture than it does to see it.

This difference between the two types of temporality becomes even more virulent if, instead of comparing the reading of written lines to the reading of pictures, we compare it to viewing movies. We all know that a film is a linear sequence of pictures, but while reading or viewing a film, we forget this fact. Indeed, we *have* to forget it if we want to read the film. How, then, do we read it? This question has been asked by a number of sciences, and is eliciting detailed physiological, psychological and sociological answers. (This is important, because knowing these answers enables film and TV producers to change films and film-making, and thereby to change the behavior of those who watch them, i.e., mankind.) But the scientific answers, by being "objective," fail to show the existential aspect of reading films, which is the one that matters in considerations like these.

It may be said that films are read as if they were a series of pictures. But these pictures are not identical with the pictures of which the film is physically composed, with the photographs that compose its ribbon. They are more like moving pictures of scenes in a play, and this is the reason why the reading of films is often compared to the reading of staged drama, rather than to the reading of pictures. But this is an error, because the stage has three dimensions and we can walk into it, while the screen is a two-dimensional projection and we can never penetrate it. The theatre represents the world of things through *things*, and the film represents the world of things through *projections of things;* the reading of films goes on in a plane, like the reading of pictures (although it is a reading of "talking pictures," a problem we will return to later).

How we read films can best be described by trying to enumerate the various levels of time in which the reading

goes on. There is the linear time in which the pictures of scenes follow each other. There is the time in which each picture itself moves. There is the time which it takes for us to read each picture (which is similar to, though shorter, than the time involved in reading paintings). There is the time which is meant by the story the film is telling. And very probably there are other even more complex time levels.

Now it is easy to simplify all this, and say that the reading of films is similar to the reading of written lines, because it also follows a text (the first time level). Such a simplification is true in the sense that in films, as in written texts, we get the message only at the end of our reading. But it is false in the sense that in films (unlike written texts, but like paintings) we can first grasp each scene, and then analyze it. This discloses a central difference: the reading of films goes on in the same "historical time" in which the reading of written lines occurs, but the "historical time" itself occurs within the reading of films, on a new and different level. We can easily visualize this difference. In reading written lines, we are following "historically" given points (concepts). In reading films, we are following "historically" given surfaces (images). The written line is a project toward the first dimension (an unfoldment from point to line). The film is a project which starts from the second dimension. Now, if by "history" we mean a project toward something, it becomes obvious that "history" as embodied in reading written texts means something quite different from what it means in reading films.

This radical change in the meaning of the word "history" has not yet become obvious, for a simple reason: we have not yet learned how to read films and TV programs. We still read them as if they were written lines, and fail to grasp their inherent surface quality. But this situation will change in the very near future. It is even now technically possible to project films and TV programs which allow the reader to control and manipulate the sequence of the pictures, and to superimpose other pictures upon them. Videoscopes and multi-media shows point clearly to this possibility. In consequence, the "history" of a film will be something that is partly devised or manipulated by the reader. It will even become partially reversible. Now, these developments imply a radically new meaning of the term "historical freedom." For those who think in written lines, the term means the possibility of acting upon history from *within* history. For those who think in films, however, it will mean the possibility of acting upon history from *without*. This is so because those who think in written lines stand within history, and those who think in films look at it from without.

The previous considerations have not taken into account the fact that films are "talking" pictures. But this is a problem. Visually, films are surfaces, but to the ear they are spatial. We are merged in the ocean of sound and it penetrates us; we are opposed to the world of images, and it merely surrounds us. The term "audiovisual" obscures this distinction. (It seems that Ortega, like many others, has ignored this difference when speaking of our "circumstancia." Visionaries certainly live in a different world from those who hear voices.) We can physically feel how sound in stereophonic films adds a third dimension to the surface. (This has nothing whatever to do with possible future three-dimensional films, because they will not introduce the third dimension, they will "project" it, just as paintings do through the use of perspective.) This third dimension, which drives a wedge into the surface reading of films, is a challenge to those who think in surfaces; only the future can show what will come of this.

Let us recapitulate what we have tried to say in the preceding paragraphs. Until very recently, official Western thought has expressed itself much more in written lines than in surfaces. This fact is important. Written lines impose a specific structure on thought, in that they represent the world by means of a point sequence. This implies an "historical" being-in-the-world of those who write and read written lines. But in addition, surfaces have always existed, and these also have represented the world. They impose a very different structure on thought in that they represent the world by means of static images. This implies an "unhistorical" being-in-the-world of those who make and read these surface images. Very recently, new channels for the articulation of thought have come about (like films and TV), and official Western thought is taking increasing advantage of them. They impose a radically new structure on thought, in that they represent the world by means of moving images. This implies a post-historical being-in-the-world of those who make and read these moving images. In a sense, it may be said that these new channels incorporate the temporality of the written line into the picture, by lifting the linear historical time of written lines on to the level of the surface.

Now, if this is true it means that "surface thought" is absorbing "linear thought," or is at least beginning to learn how to do so. And this implies a radical change in the climate, the behavior patterns, and the whole structure of our civilization. This change in the structure of our thinking is an important aspect of the present crisis.

Adequation of "Surface Thought" to "Things"

Let us now ask quite a different sort of question. We can take a stone, as an example. How is that stone out there (which makes me stumble) related to a photograph of it, and how is it related to its mineralogical explanation? The answer *seems* to be easy. The photograph represents the stone in the form of an image; the explanation represents it in the form of a linear discourse. This means that I can *imagine* the stone if I read the photograph, and *conceive* it if I read the written lines of the explanation. Photograph and explanation are mediations between me and

the stone; they put themselves between the stone and myself, and they introduce me to it. But I can also walk directly toward the stone and stumble over it.

So far so good, but we all know that the matter is not so easy. The best we can do is to try to forget all we were told at school about such matters, for the following reasons: Western epistemology is based on the Cartesian premise that to think means to follow the written line, and it does not give the photograph its due as a way of thinking. Let us therefore try to forget that, according to our school's tradition, to adequate thought to thing means to adequate concept to extension (point to body). The whole problem of truth and falsehood, of fiction and reality, must now be reformulated in the light of the mass media if we are to avoid the barrenness of academism.

However, the stone we have offered as an example is not really typical of our present situation. We can walk right up to a stone, but we can do nothing of the sort with most of the things that determine us at present—either the things that occur in explanations, or the things that occur in images. The genetic information or the Vietnam war, or alpha particles, or Miss Bardot's breasts are all examples. We may have no immediate experience of any of these kinds of things, but we are nonetheless determined by them. With such things, there is no point in asking how the explanation or the image is adequate to them. Where we can have no immediate experience, it is the media themselves which are the things for us. To "know" is to learn how to read the media in such cases. It does not matter at all whether the "stone" (namely, the alpha particle or Miss Bardot's breasts) is "really" somewhere out there, or whether it merely appears in the media; such "stones" are real in that they determine our lives. We can state this even more strongly: we know that some of the things that determine us are deliberately produced by the media, like speeches of presidents, Olympic games and important weddings. Is there any sense in asking whether the media are adequate to these things?

Nonetheless, we can go back to the stone as an extreme, although non-typical, example. Because, after all, we still have some immediate experience left, even though it is diminishing. (We live in an expanding universe: the media offer us more and more things of which we can have no immediate experience, and take away, one by one, the things with which we can communicate directly.) Now, if we still cling desperately to the stone we may venture the following statement: We live, roughly speaking, in three realms—the realm of immediate experience (stone out there), the realm of images (photograph), and the realm of concepts (explanation). (There may be other realms we live in, but let us disregard them here.) For the purpose of convenience, we may call the first realm "the world of given facts," and the other two, "the world of fiction." Now our initial question can be stated thus: How does fiction relate to fact in our present situation?

One thing is obvious: fiction pretends, very often, to represent facts by substituting for them or pointing at them. (This is the case of the stone, its photograph and its explanation.) How can fiction do this? Through symbols. Symbols are things that have by convention been appointed as representatives of other things (be that convention implicit and unconscious, or explicit and conscious). The things which symbols represent are their meaning. We must therefore ask how the various symbols of the world of fiction relate to their meanings. This shifts our problem to the structure of the media. If we take advantage of what was said in the first paragraph, we may answer the question as follows: Written lines relate their symbols to their meanings point by point (they "conceive" the facts they mean), while surfaces relate their symbols to their meanings by two-dimensional contexts (they "imagine" the facts they mean—if they truly mean facts and are not empty symbols). Thus our situation provides us with two sorts of fiction: the conceptual and the imaginal; their relation to fact depends on the structure of the medium.

If we try to read a film, we must assume a point of view which the screen imposes upon us; if we do not do this, we can read nothing. The point of view is from a chair in the cinema. If we sit on the chair, we can read what the film means. If we refuse to take the chair, and approach the screen, we only see meaningless light spots. On the other hand, if we try to read a newspaper, we need not assume a point of view imposed on us. If we know what the symbol "a" means, it does not matter how we look at it—it always means itself. But we cannot read the newspaper unless we have learned the meaning of its symbols. This reveals the difference between the structure of conceptual and imaginal codes and their respective means of decodification. Imaginal codes (like films) depend on predetermined viewpoints; they are subjective. And they are based on conventions which need not be consciously learned; they are unconscious. Conceptual codes (like alphabets) depend on predetermined viewpoints; they are objective. And they are based on conventions that must be consciously learned and accepted; they are conscious. Therefore, imaginal fiction relates to fact in a subjective and unconscious way, while conceptual fiction relates to fact in an objective and conscious way.

This may lead us to the following interpretation: Conceptual fiction ("line thought") is superior and posterior to imaginal fiction ("surface thought"), in that it makes facts and events objective and conscious. Indeed, this kind of interpretation has dominated our civilization until recently, and it still explains our spiteful attitude toward the mass media. But it is wrong, for the following reason: When we translate image into concept, we de-compose the image—we analyze it. We throw, so to speak, a con-

ceptual point-net over the image, and capture only such meaning as did not escape through the meshes of the net. Therefore, the meaning of conceptual fiction is much narrower than the meaning of imaginal fiction, although it is far more clear and distinct. Facts are represented more *fully* by imaginal thought, more *clearly* by conceptual thought. The messages of imaginal media are richer, and the messages of conceptual media are sharper.

Now we can better understand our present situation, so far as fact and fiction are concerned. Our civilization puts two types of media at our disposal: those of linear fiction (like books, scientific publications and computer printouts), and those of surface fiction (like films, TV pictures and illustrations). The first type may mediate between ourselves and facts in a clear, objective, conscious or conceptual way, but it is relatively restricted in its message. The second type may mediate between ourselves and facts in an ambivalent, subjective, unconscious or imaginative way, but it is relatively rich in its message. We can all participate in both types of media, but participation in the second type requires that we first learn how to use its techniques. This explains the division of our civilization into a mass culture (those who participate almost exclusively in surface fiction) and an élite culture (those who participate almost exclusively in linear fiction).

For both these groups, getting at the facts is a problem, but it differs for each. For the élite, the problem is that the more objective and clearer the linear fiction becomes, the more it is impoverished, since it tends to lose contact with the facts it wants to represent (all meaning). Therefore, the messages of linear fiction can no longer be made satisfactorily adequate to the immediate experience we still have of the world. For the mass culture, the problem is that the more technically perfect the images become, the richer they become and the more completely they substitute themselves for the facts they may have originally represented. Therefore the facts are no longer needed; the images can stand for themselves, and thus lose all their original meaning. They no longer need to be made adequate to the immediate experience of the world; that experience is thus abandoned. In other words, the world of linear fiction, the world of the élite, is more and more disclosing its merely conceptual, fictitious character—and the world of surface fiction, the world of the masses, is masking its fictitious character ever more successfully. We can no longer pass from conceptual thought to fact for lack of adequation, and we can no longer pass from imaginal thought to fact for lack of a criterion that enables us to distinguish between fact and image. In both instances we have lost our sense of "reality," and thus we have become alienated. (For instance, we can no longer say whether the alpha particle is a fact, or whether Miss Bardot's breasts are real, but we can now say that both questions have very little meaning.)

But it may well be that this alienation of ours is nothing but a symptom of a passing crisis. It may be that what is happening at present is the attempt to incorporate linear thought into surface thought, concept into image, élite media into mass media. (This is what the first paragraph tried to argue.) If that should turn out to be the case, imaginal thought could become objective, conscious and clear, while remaining rich, and could therefore mediate between ourselves and the facts in a far more effective way than has so far been possible. How might this take place?

This development involves a problem of translation. So far, the situation has been approximately thus: Imaginal thought was a translation of fact into image, and conceptual thought was a translation of image into concept. (First there was the stone, then the image of the stone, then the explanation of that image.) In the future, the situation may become thus: Imaginal thought will be a translation from concept into image, and conceptual thought a translation from image to concept. In such a feed-back situation, an adequate model can finally be elaborated. First there will be an image of something, then there will be an explanation of that image, and then there will be an image of that explanation. This will result in a model of something (this something having been, originally, a concept). And this model may fit a stone (or some other fact, or nothing). Thus a fact, or the absence of a fact, will have been disclosed. There would once more exist a criterion of distinction between fact and fiction (fit and unfit models), and a sense of reality would have been recovered.

What has just been said is not an epistemological or ontological speculation. (As such, it is very problematical.) It is rather an observation of tendencies at work in the present situation. The sciences, and other articulations of linear thought like poetry, literature and music, are taking increasing recourse to imaginal surface thinking; they are able to do so because of the technical advance of surface media. And in a similar way, these surface media, including painting, graphics and posters, are taking increasing recourse to linear thought, and they can do so because their own technical advance permits it. Although what has been said may be theoretically problematic, therefore, it has already begun to be realized in practice.

Fundamentally, this means that *imaginal thought is becoming capable of thinking about concepts*. It can transform a concept into its "object," and can therefore become a meta-thought of conceptual thinking. So far, concepts have been thinkable only in terms of other concepts, by reflection. Reflective thought was the meta-thought of conceptual thinking, and was itself conceptual. Now, imaginal thought can begin thinking about concepts in the form of surface models.

No doubt this is all far too schematic. The actual situation of our civilization is far more complex. For instance, there are tendencies toward thinking in the round, in the third dimension. Of course, such three-dimensional media have always existed, as proved by paleolithic sculpture. But what is happening now is very different. An audio-visual TV program that can be smelled and that provokes bodily sensations is no sculpture. It is one of the advances of thought toward representing facts bodily, the results of which cannot yet even be suspected. It will no doubt enable us to think about facts which are presently unthinkable. Certainly, there are also other tendencies within our civilization which have not been taken into account in the foregoing schema. But we hope it will serve its present purpose: to show an aspect of our crisis, and one of the possibilities which may enable us to overcome it.

To return to our argument, at present we dispose two media between ourselves and the facts—the linear and the surface. The linear are becoming more and more abstract, and are losing all meaning. The considerations before us indicate that they may be conjoined in a creative relationship. A new kind of medium may thus emerge, permitting us to rediscover a sense of "reality"; in this way we may be able to open up fields for a new type of thinking, with its own logic and its own kind of codified symbols. In short, the synthesis of linear and surface media may result in a new civilization.

Toward a Post-Historical Future

Let us now ask ourselves what appearance this new kind of civilization might have. If we examine the present civilization from an historical point of view, it initially appears as a development of thought from imagination toward concept. (First there were the wall paintings and the Venuses of Willendorf, and then there were the alphabets and other linear modes, ultimately like Fortran.) But such a simple historical view at some point begins to fail us. Our present imaginal media (films, etc.) are obviously developments from conceptual thought; for one thing, they result from science and technology, which are conceptual. And in addition, they are developments from conceptual thought in that they advance along linear discursive lines, which are conceptual. (A Venus of Willendorf may tell a story, but a film tells its story differently; it tells it historically, along a line.) Thus we must rectify our explanation: the present civilization does not look like the result of a linear development from image to concept, but rather like the result of a sort of spiral movement from image through concept to image.

We may state this as follows: When man assumed himself subject of the world, when he stepped back from the world to think about it—when he became man—he did so mainly thanks to his curious capacity to imagine the world. Thus he created a world of images to mediate between himself and the world of facts with which, because of this distance-taking process, he was beginning to lose contact. Later he learned how to handle his imaginal world, thanks to another human capacity—the capacity to conceive. Through thinking in concepts, he became not only subject to an objectified world of facts, but also subject to an objectified world of images. Now, however, by again taking recourse to his imaginal capacity, he is beginning to learn how to handle his conceptual world. Through imagination, he is now beginning to objectify his concepts and thus to free himself from them. In the first position, he stands in the midst of static images (in myth); in the second position, he stands in the midst of linear progressive concepts (in history); in the third position he stands in the midst of images that order concepts (in "structures"). But this third position implies a being-in-the-world so radically new that its manifold impacts are difficult to grasp.

Let us therefore use a metaphor—the theatre. The mythical position would correspond to that assumed by a dancer enacting a sacred scene. The historical position is represented by the role assumed by an actor in a play. The structuralist position then might correspond to that assumed by the author of the play. The dancer knows that he is acting the ritual; he knows that the symbolic mode is demanded by the reality he is to represent. If he were to act differently, it would be a betrayal of reality, a sin; his only freedom therein is to sin. The actor also knows that he is acting; he knows that the symbolic quality of his performance is a theatrical convention. He may therefore interpret this convention in various ways, and thereby change or modify the convention; herein lies his freedom which is, strictly speaking, historical. The author of the play knows that he is proposing a convention within limits imposed upon him by the theatrical medium, and he tries to give meaning to his convention; his freedom is structural. Seen from the point of view of the dancer, the actor is a sinner and the author is a devil. Seen from the point of view of the actor, the dancer is an unconscious actor, and the author is an authority. Seen from the point of view of the author, the dancer is a puppet, and the actor is a conscious tool from which he (the author) continuously learns.

The example of the theatre is, however, not a very good one. It does not adequately display the third position, because this does not truly exist in the theatre as yet; it is too recent. Let us therefore try another example which may reveal the third position more clearly: the future role of a TV spectator. Such a spectator will have at his disposal a video-theatre, including a magnetic tape library of various programs. He will be able to mix them in many ways, and thus compose his own programs. But he will be able to do more: film his own program, include himself and others, register this on a tape, and then project it on

his TV screen. He will thus see himself on his program. This means that the spectator will control the beginning, middle and end of the program (within the limitations of his video-theatre), and that he will be able to play any role in the program he desires.

This sketch reveals more clearly the difference between the historical and the structural being-in-the-world. The spectator is still determined by history (by the video-theatre) and he still acts within history (by appearing on the screen himself). But he is beyond history in the sense that he composes an historical process, and in the sense that he may assume any role he desires in the historical process. This may be stated even more forcefully: although he acts in history and is determined by history, he is no longer interested in history as such, but in the possibility of combining various histories. This means that history for him is not a drama (as it is for the historical position); it is a game.

This difference is, basically, a difference in the temporality of the two positions. The historical position stands in historical time, *in* the process. The structural position stands in that sort of time wherein *processes are seen as forms*. For the historical position, processes are the method by which things become; for the structural position, processes are the way things appear. Another perspective on things from the structural position is to view processes as parameters or dimensions which determine things. The historical method de-composes things into phases; it is diachronical. The structural method joins phases into forms; it is synchronical. For this method, whether processes are facts or not depends upon one's perspective.

Furthermore, those things that stand in opposition for the historical position (matter-energy, entropy-negentropy, positive-negative, and so on) are complementary for the structural position. This means that historical conflict, including wars and revolutions, does not look like conflict at all from the structural position, but as sets of complementary moves in a game. This is why the structural position is often called inhuman by those who see things from an historical point of view. It *is* inhuman, indeed, in the sense that it is characteristic of a new type of man who is not as yet recognized as such by members of the older type.

Herein lies a problem. All that has been said concerning the third position has been composed into written lines, and is therefore a product of conceptual thinking. But if the argument is even partly correct, the third position cannot be conceptualized; it must be imagined with the kind of imagination that is now being formed. Therefore this essay can only be suggestive. On the other hand, unless we try to incorporate concept into image, we shall fall victim to a new form of barbarism: confused imagination. This fact may offer a kind of justification, *quand-même,* for this essay. For it is a present truth that the third position is now being assumed, whether we can conceive it or not, and it will certainly overcome the historical position as time goes on.

Let us, then, recapitulate our argument, in order to try to suggest what form the new civilization might take. We have two alternatives before us. First, there is the possibility that imaginal thinking will not succeed in incorporating conceptual thinking. This could lead to a generalized de-politization, de-activation, and alienation of mankind, to the victory of the consumer society, and to the totalitarianism of the mass media. Such a development would look very much like the present mass culture, but in more exaggerated or gross form. The culture of the élite would disappear for good, thus bringing history to an end in any meaningful sense of that term. The second possibility is that imaginal thinking will succeed in incorporating conceptual thinking. This would lead to new types of communication in which man consciously assumes the structural position. Science would then be no longer merely discursive and conceptual, but would have recourse to imaginal models. Art would no longer work at things ("oeuvres"), but would propose models. Politics would no longer fight for the realizations of values, but would elaborate manipulable hierarchies of models of behavior. All this would mean, in short, that a new sense of reality would articulate itself, within the existential climate of a new religiosity.

All this is utopic. But it is not fantastic. He who looks at the scene can find everything already there, in the form of lines and surfaces already working. It depends very much on each one of us which sort of post-historical future there will be.

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GERARD RADNITZKY

Life Cycles of a Scientific Tradition

INSIGHT INTO THE DIFFERENT DEVELOPMENTAL STAGES OF TRADITIONS, WITH THEIR DIFFERENT IDEALS OF RESEARCH, CAN AID THE GROWTH OF KNOWLEDGE

Introduction: Anthropological Reflections on Traditions

"TRADITION," "SCHOOL," "STYLE," and similar concepts belong to the conceptual tools of cultural history, conceived in the widest sense as including the histories of science, of philosophy and of art, and also, as including *contemporary* history. A view of history is necessary for the self-understanding of an individual, of a group, of a culture, of an age. Such a view of history merges into an analysis or an understanding of the contemporary situation: whether it be within a personal life, or in the larger context of a discipline. For the comparative study of civilizations one needs a model of civilizations; for the comparative study of traditions (styles of philosophizing, or of schools within a scientific discipline), one needs, among other things, a *model of tradition/school/style*. What is common to various styles of intellectual enterprise in an epoch creates the "cultural climate" or the "horizon of intention" of that epoch; this embraces such things as a taste for certain concepts or certain categories. It limits the "maneuver space" for everyone but the exceptionally innovative individual, and it belongs mainly to what M. Polanyi has called "the tacit dimension." In Whitehead's words: "When you are criticizing the philosophy of an epoch, do not chiefly direct your attention to those intellectual positions which its exponents feel it necessary explicitly to defend. There will be some fundamental assumptions which adherents of all the variant systems within the epoch unconsciously presuppose."[1] A part of these presuppositions will be "embodied," so to speak, in ordinary language, into which have sedimented the various special languages of successful scientific traditions, schools of philosophy and so on. There is a dialectic between these global presuppositions—what Whitehead called "the philosophy of an epoch" which constitutes a sort of "steering field" (if this metaphorical expression is allowed and used without any scientistic overtones) within which the various traditions (that is, systems of intellectual enterprise) exist—and these traditions. The traditions will be influenced, guided and limited by this "field," but in turn, they have a certain leeway to change it. Analogously, there will be a dialectic between a tradition and the creative innovator: although he will always stand within *many* traditions and be bound by them, he may through reflection distantiate himself and change them.

Science is born of that estrangement from the universe which occurs when it is no longer experienced as the world of everyday life. Philosophy begins when we question the taken-for-granted world. The common feature of both

cases is the *distantiating*, "creative alienation," or "eccentric positionality" as Helmut Plessner has called it,[2] which constitutes one of the unique characteristics of man. In contemporary man, it has developed into a need for a critical self-conception, as Helmut Schelsky has shown.[3] By distantiating himself from his scientific and philosophical traditions, the creative individual is always the exceptional individual, a nonconformist who questions his tradition and finds himself questioned by it. Outside natural science, when we are confronted with a new text, or with an unexplained action or a strange culture, a "re-search" situation arises only if we let the text, or the action, question *us*. When an "object" is uprooted from its customary context and poses a question to us, it creates a distance between us and the transmitted message.[4] This is the so-called *hermeneutic situation*.

Tradition in its most encompassing form and most obvious sense is language itself: language is *the* meta-institution.[5] This is tantamount to saying that it is one of the preconditions of intellectual life, that is to say, of human life. As mediation of tradition par excellence, language institutionalizes perspectives (ways of looking at the world and at man), categories, and modes of action. Linguistic traditions achieve what Arnold Gehlen has ascribed to institutions, *viz*. an "unburdening," a sort of security which has some analogy to instinctual security.*[6] Language has always a dogmatic element: it binds us to a certain form of life. This holds for ordinary language, and also for the special languages of scientific traditions. Ordinary language, however, leaves us freedom to play with it—in poetry or drama or humor—whereas special languages, or the special forms of life constituted by a style of doing research, appear to provide such leeway mainly if the scientific tradition carrying it begins to feel competition from other scientific traditions. This occurs typically, in connection with a "crisis of foundations" of a discipline, which often originates in the old tradition's incapacity to respond to the challenge posed by important novel results.

In sum, although through reflection the philosopher may distantiate himself from any concrete commitment, he is always also bound by the very language he uses in the process of reflection, hence the distantiation can never be absolute.

Let us pause to glance at what anthropology has to say about tradition, for an archaic context may provide a distantiating effect, enabling us to pay attention to features in scientific traditions which may hitherto have escaped us. From the point of view of anthropology, tradition gives the present a starting point in the conduct of past generations. Experience would be lost if it were not distilled into a form that can be handed on. This enrichment, this mediation of experience, of knowledge and behavior, from one generation to another, is another of the differentiating characteristics of man. The ethnocentricity of preliterate cultures had the important side effect of ensuring the *correct* mediation of tradition, "screening off" the group by means of rituals and taboos.[7] Traditions also achieve a *stabilization* in time: they ensure that the past still retains some of its validity. (It is the rapid pace of change in contemporary industrial civilization which gives rise both to anxiety and to futurology.) One of the preconditions of the development of historical consciousness is a *break in tradition:* for example, we see in the history of the Diaspora one of the preconditions for the development of the Jewish religion.

From the point of view of cultural anthropology and the history of ideas, attempts have been made to devise models for comparing different styles or movements in literature, in the arts (especially in architecture), in philosophy and in science, with a view to constructing the *physiognomy of an epoch* (its "intellectual climate" or "horizon of intention") in order that we may better understand it.[8]

Instead of following this line, however, I propose to focus on a particular realm of intellectual life, that is, on scientific research. This is in a way easier to study than other realms, because its procedures are at once more articulate and more rationalized than other realms of action. (Even if there, too, the part that is articulated is like the part of an iceberg which shows above the surface.) In short, I should like *to sketch the life-cycles of a particular type of cultural tradition, viz*. a model of a scientific tradition, of a "school" within a discipline or a "research direction."

I

Since I can point here only to a few general ideas, I have decided to join forces with the existing literature on the subject. Since Kuhn's conception is known by everyone interested in philosophy or history of science, he seems to offer the best point of contact. In his now famous book, *The Structure of Scientific Revolutions,* Thomas Kuhn argues that during "normal" periods of science a certain "paradigm" (which comprises certain basic models, methods and criteria of meaning) is generally accepted. During this period, science is simply a matter of problem-solving.

*Gehlen's concept of "unburdening" has a counterpart in N. Luhmann's thesis that social systems achieve a reduction of complexity (of everyday life, or intellectual life, and so on). It also has a clear counterpart in T. S. Kuhn's "paradigm": the researcher who works within a paradigm is by that paradigm "unburdened" from philosophical problems of his discipline, and also enabled to screen himself off from the enormous mass of questions, perspectives, etc. suggested in the intellectual environment. When a "shift in paradigm," a "roupture épistémologique" (G. Bachelard, M. Foucault) occurs, this unburdening is no longer achieved, and the situation will in some measure become chaotic. (Hence Gehlen thinks that the institutions that carry the important traditions have to be protected from man so that in future they may continue to protect man.)

Sometimes the paradigm itself has to be overthrown, and this is what Kuhn calls a "scientific revolution," a "change of world-view," a break of tradition. Competing paradigms are radically incommensurable with one another; the transition from one to the other is like a "Gestalt switch," and cannot be compelled by logic and experiment alone. Kuhn writes, "Research conducted within a tradition, under the guidance of . . . a paradigm, . . . depends, in part, on the acceptance of elements which are not themselves subject to attack from within the tradition, and which can be changed only by a transition to another tradition, another paradigm.[9]

Kuhn has been criticized, by Ernan McMullin for example, in that "the book has the vices of vagueness and circularity that are all too often associated with this sort of quasi-sociological inquiry."[10] But Kuhn's strength lies in the vast empirical material from the history of physics which he supplies, and which in part explains the extraordinary success of his book. He is an important member of the trend that Dudley Shapere has termed "the new philosophy of science": one that focusses not on the products but on the process of science—upon research itself. Moreover, since the appearance of Kuhn's book, it has become a *commune bonum* along philosophers of science that (to vary the well-known Kantian dictum) while history of science without philosophy of science is blind, philosophy of science without history of science is empty.

Perhaps Kuhn's ideas are not as revolutionary as the Anglo-American world might be inclined to think. His conception of "Paradigm Shift" has great affinity with the idea of *coupures epistémologiques* (epistemological rupture), a theme discussed in France since Gaston Bachelard and basic to M. Foucault's "archeology" of the human sciences or of European thought.[11] Likewise, the belief that the history of any discipline, or of intellectual history in general, may be stylized by means of two ideal types which dialectically presuppose each other—*viz.* as a sequence of periods of "Normal Science" interrupted by "Paradigm Shifts" (as suggested by a spiralling staircase)—has cognates in other traditions.[12] Here I will, however, take Kuhn and the Popper-School as sole representatives of this line of thought.

Kuhn, Lakatos and Feyerabend have devoted considerable attention to the *mediation of tradition in science*. In the English-speaking world, they constitute a very important element of the trend from the logical empiricists' "logic of science" toward a hermeneutic of science. In particular, in Imre Lakatos' recent work it becomes very clear that this type of philosophy of science is essentially a normative-hermeneutic process whereby the rationality sought in the work of the great physicists (as it is extracted and articulated by means of the "rational reconstruction" of the history of science) and the normative concept of rationality (underlying the Popper school of critical philosophy) can mutually correct each other. Rational reconstruction of the history of science and criticism of this history together form an example of the so-called hermeneutic circle.* However, it is equally apparent that this style within philosophy of science (especially Kuhn, Feyerabend and Hubner) has arrived at a position which essentially is a new version of the historical-relativism that played such an important role in the German philosophy of the *Geisteswissenschaften* (from Dilthey and Troeltsch onward). This position conceives philosophy of science as essentially historical hermeneutics—as attempts to understand scientific traditions, systems of theories, etc., "from within," from the point of view of the tradition concerned. Since, at least in the most interesting cases—those of extraordinary innovations and paradigm shifts—these traditions are considered as basically "incommensurable," the idea of progress becomes problematic *even* for the history of physics. This is tantamount to a skeptical position with respect to the possibility of a normative philosophy of science. What then remains for the philosopher of science is a hermeneutic study of historically given traditions and their systems of theories. As *counterbalances* to this historistic-relativistic tendency, two approaches offer themselves, both of which agree on the thesis that there is a *telos* in science, a telos which embodies the human ideal of Scientific Reason. The first approach embodies a theory of research which is oriented towards the norms inherent in the practice of a science (as distinguished from its theory); this we can call *normative-praxiological*. The second is a study of research which has been inspired by *hermeneutic phenomenology* (P. Heelan, T. Kisiel, J. Kockelmans).

The program I propose to sketch here emphasizes the first of these approaches and chiefly uses its conceptual categories and models of the development of scientific knowledge, in order to take a first step toward a theory of research traditions. In taking such a first step, one must be careful to avoid erecting boundary walls between philosophical and sociological/anthropological studies.

II

If, in the history of science or in the contemporary scene, we find that a sufficient number of research enterprises show so much similarity, have so much in common, that it is useful to group them together, we can regard them as a *tradition*, or school. Then we will ask *why* this similarity or continuity exists in spite of diversity and change.

In such a case, we should try to discern what we have called the "internal steering field" of a research enterprise—the external part being the human context (the social life-world) in which it is embedded. That por-

* This circle (or spiral) is a model of the development of knowledge whereby anticipation of the global meaning becomes articulated through a process in which the meaning of the parts is determined by the whole, and also determines the global meaning as a whole.

tion of the internal steering field which is most explicit is the criteria—which the researchers claim to use, those in which they believe, and those which de facto govern their practice insofar as this practice is planned and organized. In order to unearth the criteria that actually have governed a given research practice, and then try to find out the presuppositions that underlie the criteria, we undertake a process of enquiry that is itself essentially *hermeneutic*. This theory considers research essentially as a transformation of complexes which consist of *knowledge*, of *problems*, and of *instruments*. "Knowledge" is thereby taken in the wide sense as what cannot be proved, but can be *im*proved. So far as natural science is concerned, it is regarded as a sort of "map" over some physical system or section of the world (*territory*), which in the course of research is improved so that both its "mapping reliability" and its content of information increase. In the course of research, not only is knowledge produced and systematized, but also problems are processed, and instruments are developed.

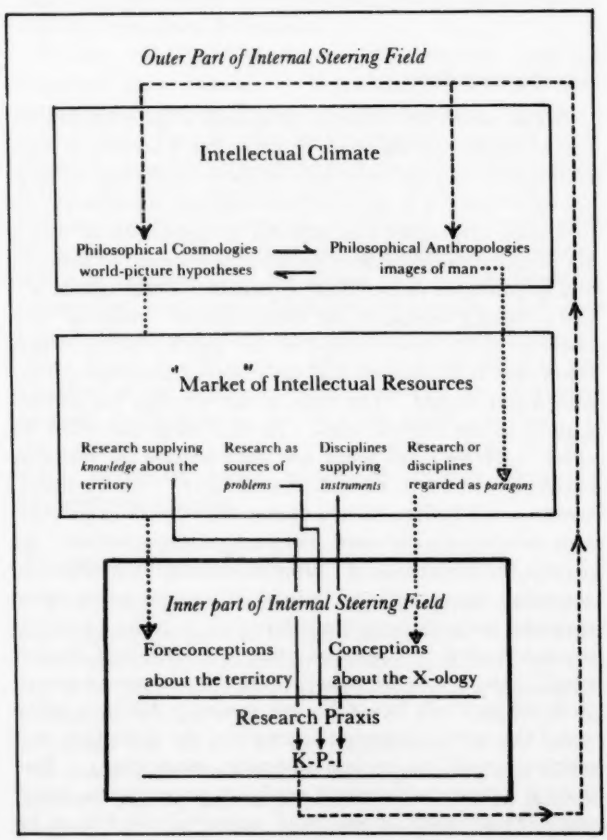


Figure 1

Having articulated the criteria and the factors underlying them, the next task is to evaluate them critically, in terms of a given research undertaking. I venture to submit that they ought to be justified also with respect to our human ideal of Scientific Reason. The critique of the factors underlying the criteria, the preconceptions about the territory, etc., with respect to the idea of Scientific Reason will also involve finding out the necessary preconditions for science as such and for special types of scientific inquiry—and in this sense it may be regarded as belonging to "transcendental" philosophy.

In a "rational reconstruction" of the history of science, one can—with the benefit of hindsight—find out the "maneuver space"; that is, find out which Knowledge-Problems-Instruments developments would have been (rationally) possible, given the internal steering factors, without a break in tradition. One cannot write a significant historical account of a major scientific advance without having made such a rational reconstruction,[13] but neither can one hope to understand the actual history of such an advance without an account of the effects of the external steering factors, and of the psychological, sociological aspects of the researchers. "External history" and "distilled history" (reconstruction of the lines of development which would have been rationally possible in the historically given situation) are intertwined. Nonetheless, description-and-explanation must be distinguished from hermeneutic-normative reconstruction and criticism; this may be taken as the postulate of the "dialectic of history that mediates between materialism and idealism," or as a facet thereof.

III

In a period of "normal science," The Knowledge-Problems-Instruments developments produced under the auspices of the given research enterprise are satisfactory: the internal steering field is functioning well. Hence there is no reason why the researchers should critically reflect on the internal steering field (criticize their criteria and practices), and so it remans fairly stable, slowly evolving. By characterizing normal science in this way, one has also characterized its opposite ideal type; in terms of the above models, a "paradigm shift" is essentially a shift in perspective.

Why does such a shift in perspective (a shift in anticipatory preconceptions about the nature of the territory) occur? The typical reason appears to be that the reigning tradition has been incapable of accounting for novel results—especially if the novel knowledge or its resulting theories "clash" with those of the old tradition. (This theme is developed in Part III of my *Contemporary Schools of Metascience* (Gateway Paperbacks).)

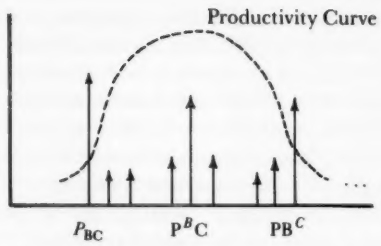
If we succeed in understanding why a shift in perspective did occur, we will ask the normative question, "Was it an advance, and if so, in what sense?" If, with Kuhn,

one considers science bascially as a game played by a scientific community and based upon the rules and criteria agreed upon by that community, this type of question will have to be rejected. Yet the question is of strategic importance: are there, or are there not, overarching criteria—better *types* of criteria which transcend particular traditions and which can be derived from our "human ideal of scientific reason," something which is common to the internal steering fields of all scientific enterprises?

IV

The thesis I want to submit is as follows: First, that there *are* types of criteria that span different traditions; second, that each type of criteria scientists use is differently weighted in different research traditions, and this weighting changes during the career of a single tradition in a systematic way. To spell this out we should need a model of the rise and decline of successful scientific schools. I will metaphorically speak of a "life cycle" of a tradition,[14] but here a warning is in order: Such a model of the "life cycle" is *not* deterministic other than in the trivial sense that in order to be efficient a productive enterprise (even that of an individual working largely on his own) must pass through a certain sequence of phases. This is a characteristic of efficient work, and certainly not a law of history. "Phases," of course, are descriptive of *ideal types* within a process which is in reality a continuum of small changes that interlock and dovetail. Ideally, for each of the typical phases we should develop a model which distinguishes the various internal steering factors at work and their interaction with the intellectual environment and with the human context. Here, I shall limit myself to some general reflections.

In order to trace the life cycle of a tradition, we can begin by identifying some rather obvious types of phases through which it passes. First, there is a period of prospecting (task-prospecting, prospecting for tools, skimming the relevant literature, etc.), which we call a *Pioneer* (or programmatic) phase (*P*). Next comes a phase during which the program is carried out, or a *Building* phase (*B*), and then a phase where the focus is upon internal *criticism* of the results obtained (*C*). Each phase will have its characteristic ranking of types of criteria, a typical attitude toward the Internal Steering Field; each will have different types of communication and a different quale (quality) of the research procedures. Of course, within each phase there will occur activities such as project-making, problem-solving and internal criticism; in short, *within each* there will be both innovative and stabilizing elements, but in different degrees and combinations. It will help us to sharpen the ideal type of each phase if we, schematically, identify each by means of a characteristic combination of three factors: *P, B* and *C*. (Figure 2 is an expository device and must not be taken too seriously.)



Proportion of Pioneering, Building and Critical Intellectual Orientations in the major phases of Research Traditions.

Figure 2

The Pioneering Phase

In this model, the *P*-factor designates what is characteristic of the Pioneering phase of a research tradition: a high willingness to take risks and a great openness to new points of view. The criteria used will put a premium on creativity, originality and richness of ideas—all of which are primarily applicable to production *processes*, to projects and to strategies rather than to *products*. These characteristics—which belong to the dimension of "steering" are essential to the development of this phase, during which the *prospect* is articulated and the research program is processed and refined. The time is not yet ripe for investigations in the narrow sense. At this stage one must be open—alert for clues, ideas and tools outside the research enterprise, which is still in a nascent state. This openness, however, will be limited in a characteristic way: a polemic edge directed against some older competing tradition. As regards the dimension of "communication," the situation is special: the exceptional individual, around whose basic ideas the research program is forming, is likely to experience difficulty in communicating his "personal knowledge" to those who are to help him carry the new research tradition forward; hence he will probably have to make use of the special languages current in the discipline, and restrict himself to certain linguistic innovations. Frequently a potential research tradition stops at this stage, when the prospect shows itself unfruitful, or has to be abandoned for other reasons.[15] It may happen that in a discipline a number of such "incipient" research-directions exist beside each other. There is also the possibility that a tradition which once has been abandoned may be revived, in modified form.

The Building Phase

The characteristic of the Building or consolidating phase, and of Normal Science (where, as Kuhn says, internal criticism is at a minimum) is an interest in *problem-solving*. (This places the center of concern on the dimension of "investigation.") The willingness to take risks (essential for the physiognomy of the *P*-phase) is of medium strength, and so is the interest in internal criticism (*C*-phase). Solidity of and good use of *methods* are important in the criteria system, as are the improvement of instruments (software and hardware) and the credibility of the knowledge (laws, explanations, theories, etc.) produced. In this phase, the internal steering field will be strongest, "embodied," even if tacitly, in the *special language* of the tradition, which is now fully developed. This makes in-group communication easy and efficient.[16] (As yet one is not so much interested in reporting to others, outside the tradition.) The stability of the internal steering field is evident from the fact that in such Building periods of normal science, physicists show no interest in the philosophical problems of their discipline, which would indeed distract them from their work.

In sum, this Building-phase in the research tradition functions as a *stabilizer* of Knowledge-Problems-Instruments developments. Moreover the tradition's "tool box" is enriched. Part of what in the original prospect were inspired guesses is being replaced by authentic knowledge. It is in this phase that the *masterpieces* of the tradition are produced, setting the *standards of quality* for the members of the tradition. The productivity of authentic knowledge will now reach a peak by means of a simple feedback mechanism: a successful tradition will produce much new knowledge—a wealth of innovations of ordinary magnitude; hence it will attract adepts and will become entrenched in the academic system, gaining an increasing number of disciples to increase the output further. If the territory does not change, a point will be reached where saturation occurs, where the territory eventually becomes well-charted.

The Internal Criticism Phase

This is characterized by a dominant interest in improving, refining the form and organization of the Knowledge-Problems-Instruments complexes that have been the output of the previous phase—in particular of the knowledge produced. Hence the willingness to take risks will be extremely low, as will be the appreciation of new ideas. The dominant criteria will be rigor, precision and transparency, that is, criteria primarily applicable to finished *products*. In this phase, the researcher will legitimately screen himself off from the outer world—from impulses from other research traditions except those that promise to provide tools useful for the present endeavors. He will above all try to bring the knowledge system which has been achieved into a state that conforms ever more perfectly to the tradition's ideal of science. Although here and there some lacuna in the "maps," the knowledge systems over the territory, may be filled in, the research program no longer furnishes the dynamic of the research process, whose problems now emanate mainly from the task of improving the products.

The special language is now fully developed, and it is in this period that the standard texts which present the relatively finished knowledge of the tradition are produced. Being addressed to the adept, they present a "streamlined" development—a success story. (Hence, it is impossible to retrace the actual path of discovery from these texts alone.) These texts *implicitly*, in their deep or tacit levels, form the internal steering field of the tradition. Since to make oneself acquainted with a theory means that one at the same time *learns* a new way of looking at the world, the adepts who are *encultured* into a tradition by means of exposure to its standard texts are at the same time *indoctrinated* in its internal steering field. It is justifiable, I believe, to use such a word as "indoctrinated" in this connection, because insofar as the internal steering field has not been articulated, it cannot be seen through and hence is not criticized.

Often the successful tradition dominates the discipline in question. If a tradition succeeds in monopolizing the academic system, then it may even be identified with the discipline. A symptom of this state of affairs is revealed when the existence of any "schools" within the discipline is denied—a sure sign that the whole milieu is dominated by a single school.

In a discussion of criticism, a distinction should be made between *internal criticism*, i.e. a criticsm using the system of criteria governed by the internal steering field, and *external criticism*, which brings the internal steering field itself into question. I would like to interpolate a few comments on this distinction. Internal and External Criticism are themselves ideal-typical concepts. *Any living tradition is a dialectical unit.* As a "macro-tradition" it comprises several sub-traditions. For instance, a concrete cultural tradition like the Western Christian religion is a compound of different sub-traditions ("language games" in Wittgenstein and Winch's sense) standing in a continuous argumentative dialogue with each other. The external critique has always been present, "beginning with the early critique of the sacraments and the dogmas up to the general critique of religion in the Enlightenment."[17] According to the tradition of dialectics, a system constituting a whole contains "contradictions,"[18] and this state of affairs prevents the system from remaining in a changeless state. This is true also of the *institutions* which carry a tradition. Contradictions, or tensions between needs to be met and a situation not admitting this particular need satisfaction, lead to institutions which are created to

remedy that situation. These institutions create secondary needs. Hence there cannot be a changeless state of the system of institutions within a society, nor in the system of institutions carrying a tradition. In criticizing Wittgenstein and Winch, Apel points out regarding traditions, that "the language games of the concrete history of the human mind are not understandable just by and in themselves."[19] If one is unwilling to presuppose a normative (ideal) "transcendental" tradition or "language game," one will eventually fall back on a quasi-behaviorism and on historism-relativism. If this is correct (as I think it is), it is very important for the history and philosophy of science, because then Kuhn, Feyerabend and Hübner appear to be much in the same boat as Wittgenstein and Winch. If there are no over-arching criteria, no *telos*—or, in our present terminology, no over-arching internal steering field—for science, then we cannot critically compare families of theories which are separated by a break in tradition and hence we cannot evaluate the research traditions which have produced them. The question "Is this shift really an advance, and in what sense?" must remain unsettled. Two systems of theories separated by a paradigm shift—i.e. governed by internal steering fields that are drastically different—will then have to be regarded as "incommensurable." It appears to us that also Imre Lakatos' heavy reliance on the rationality supposed to be immanent in successful research practices in the history of physics (unless complemented and balanced by a theory of over-arching criteria) may make impossible a normative critique of that research praxis. In this case the dialectic between *participating* in a historically given tradition (the hermeneutic task) and *simultaneously* critically *distantiating* oneself from it (in order not "to go native") would be lost. This dialectic appears possible only if recourse to a transcendental tradition/language game is possible. So much for the distinction external/internal criticism.

In a situation where external criticism makes itself heard, some exponents of the tradition will try to shield the internal steering field, even by immunization strategies; others will enter the path whereby external criticism grows out of internal criticism. In any case, a system-dissolving factor now has made its appearance, and, if it outweighs the system-binding factor (which will be the case if the internal steering field—in particular the global conceptions about the nature of the territory—have come increasingly under attack), the tradition will eventually dissolve.

While a critical scrutiny of the products of a tradition is always necessary, if the work done consists almost exclusively in refining and making formal improvements of the products, the productivity will decrease drastically and this will eventually lead some of its exponents to question the fruitfulness of the whole approach. By comparing it with possible alternatives, they will direct attention to things that have hitherto been systematically ignored. (For example, in physics there may be empirical findings which are residual to the type of theories developed within a certain tradition. During the heyday of the tradition such residuals are simply ignored, and rightly so. When the tradition has reached a certain saturation point they suddenly get attention.)[20]

One symptom that the system-dissolving factors are gaining the upper hand is that physicists (or the researchers of the particular tradition under consideration) begin to take *renewed interest in philosophical problems of their discipline*. This shows that the internal steering field has become *problematized*, especially as regards its world-picture aspect, the global assumptions about the territory (in the case of physics, space, time, causality, matter, and so on). If the internal steering field is seriously put into question, one speaks of a "crisis of foundations." If the categories and, by implication, the perspective of the internal steering field are brought into question, the meaning of strategic expressions is no longer taken for granted, and *communication problems arise*. (At this juncture, a contention from the philosophical anthropology of knowledge becomes very conspicuous—a contention which is well-known, but well-neglected or trivialized by exponents of the "logic of science," and by behaviorists—that the *existence of a common language and hence the existence of a communication community is a precondition for all research*, even for human life. *Mutatis mutandis*, the existence of the very special communication communities carrying scientific traditions or schools is one of the preconditions of science.) Thus, when many things which hitherto have been taken for granted now appear uncertain and doubtful, the ground is prepared for a breaking of tradition.

At such a time, the phenomenon we have called the *Senility phase* (S) in our schema (fig. 2) occurs. Even though the research program of a tradition is abandoned, to all practical purposes, it may hold its own in the university system and also in the intellectual milieu in general by virtue of its *political* force in the academic world. Characteristic of this phase are various pathologies, such as the dogmatization of the internal steering field, which shows itself in touchiness about external criticism, and in various defense mechanisms such as immunization strategies or trivializations, whereby criticism may be ignored. What has been called the "ethnocentricity of scientific sub-cultures" (a term we owe to J. Habermas) can now be clearly seen, evidenced in the requirement that external criticism be first translated into the special language of the tradition, without the recognition that such a request is itself part of an immunization technique.

It is often only at this stage that sedimentation from the internal steering field (the global assumptions, the way of looking at the world or at man) of the tradition into the

general culture takes place. A sign that this is happening is the backseepage of the jargon of the school into the vernacular, most often in totalized and vulgarized form.[21] As an example of this, the so-called scientific tradition itself has been totalized into Scientism—the fundamental "false consciousness."

V

It is now time to comment on the *negative side effects* of research traditions. Such traditions are, as we have seen, indispensible, but, like everything else, they have their price in negative side effects, some of which are unavoidable. Opportunity costs may become excessively high when a single tradition *monopolizes* the intellectual milieu, the intellectual market, so that all competitors are suppressed.

So far as the tradition itself is concerned, during the Building phase there is a risk that interest in methods may become so dominating that it is they, rather than the research problems, which govern the research praxis. Since the "methods" are typically concerned with the generation of empirical data and the checking of hypotheses, it is likely that such research will be poor with respect to theory. When this is the case, the knowledge produced will be rather like a mosaic, a heap of pieces of knowledge rather than a knowledge system. (One might call this syndrome, with M. Bunge, "data-ism.") The opposite pathology may occur if, in the phase of Internal Criticism, the interest in systematization dominates to such an extent that the contact with the empirical Knowledge-Problem-Instruments development, that is, with the data level, becomes tenuous. In such a case, there is risk that beautiful models may be developed which are exact and transparent —but which cannot be applied, for they do not fit the concrete cases. (This situation, following H. Albert, may be labelled "model-Platonism.")

Finally, a word on certain dangers of success: There is a risk when a research tradition has been very successful—when it has produced much novel knowledge—that researchers and intellectuals will be tempted to *totalize its perspective,* and thereby its internal steering field as well. This means that the researcher is tempted to assume that this perspective, which has proved so fruitful in this particular field, is applicable to other aspects of the territory and indeed to other territories as well—even (in the case of those intellectuals who would act as *terribles simplificateurs*) that it is applicable almost everywhere. This may result in a pollution of the intellectual environment of other research enterprises. Something of this sort has happened with the *Weltanschauung* of "inert mechanism": the positivistic philosophies of science—functioning as paternalistic methodology—have polluted the intellectual environment of much of contemporary psychological and sociological research. The researcher will then tend to identify that aspect of the territory over which he has produced considerable knowledge with the territory itself. A symptom of this reductionistic tendency is when a single school tends to monopolize the very name of the discipline. (As, for example, if the behaviorist psychologist were to suggest that the discipline of psychology as a whole should be identified with the work he is doing.) Such reductionist tendencies may be a serious threat to the growth of knowledge in the field concerned.

A very successful tradition may (without intending it) involve certain risks for researchers in *other* disciplines: They may, uncritically, take it as an ideal, a paragon for their own enterprise. When this occurs, lack of criticism leads them to disregard whether the image of the admired tradition is correct, and whether the image (correct or not) is really suitable for emulation. In this way, many social scientists have succumbed to the desire to imitate physical science (the prestige discipline par excellence); but the image they have held before themselves was one they got from the philosophers (in this case, from the logical empiricists), not from theoreticians of physics in close contact with physical research (such as H. Törnebohm, P. Heelan, M. Bunge, P. Feyerabend, just to mention a few). Thus they have tried to copy a *false* image of physics, an image in which the successful meshing of theoretical and empiricial Knowledge-Problem-Instruments developments (which physics certainly provides) has been *reduced* to a semantic problem: the problem of the relation of a theoretical and an "observational" language (with a host of pseudo-problems, or what Feyerabend calls "philosophical jokes"). As a result, those who have believed that they were imitating physics have produced research which has become more and more unlike physics. (The situation in American academic psychology exemplifies the danger when a single tradition monopolizes the intellectual market.)

To remedy this type of situation, the internal steering field first has to be *made transparent* for the researchers, in order to make it *criticizable*. The theoretician of research here acts much like the "trouble shooter" in management consulting: he will have to *warn* by making global hypothetical predictions of the sort, "If you retain this ideal of science then the Knowledge-Problems-Instruments developments you will produce will be such and such." He will also have the task of drawing attention to the general risks involved in taking another research tradition, from another discipline, as a paragon.

However, in another context he will have the task of *facilitating* the *mediation of traditions*. This applies in particular to those cases where imports of perspectives, categories and instruments from one tradition to another might prove fruitful, but where such a mediation hitherto has not been possible because of difficulties in communication or other hindrances. From the model of the life cycle of a tradition which we have proposed, it becomes

clear that even if two traditions are not competitors (if they investigate different territories, for instance), insofar as they exemplify different stages of development they may have great difficulty in appreciating each other's work. Their criteria and value scales will be different, according to their stage of development. What for a researcher in the Pioneering phase of a tradition may be "exciting," may appear to those belonging to a tradition which is in the phase of Internal Criticism to be "unclear, imprecise, not sufficiently methodologically based." And what for the latter group may seem "respectable" because of its exactness and clarity, may to those in the Pioneering phase appear "pedantic" and "trivial."

Models such as those sketched here have an immediate purpose: to help the researcher improve his self-understanding. They could do so by providing categories for conceptualizing the research situation in a more systematic and sophisticated way, and for embarking on the hermeneutic and ideology-critical task of making transparent the mediation of tradition with respect to current research. Only if these turns have been successfully carried out can the evaluative-normative turns follow.

The freedom of the creative innovator cannot be safeguarded merely by the institutionalization of a repression-free dialogue. It will require a *political* effort, continually renewed—a fight for such freedom.[22] The role of Research Theory in this connection will be to help the researcher to see his own enterprise in a wider context: in relation to other research enterprises, in relation to the intellectual environment, in relation to external interests, including social and political forces. Models—such as the model of a tradition and identification of its life cycle, as well as models of various levels of knowledge hinted at above—may prove helpful in drawing attention to certain essential tasks. These include unravelling and articulating the Internal Steering Field of particular traditions in order to see how they relate to the intellectual environment. Such hermeneutic, critical and evaluative tasks will have to be complemented by empirical socio-cultural investigations of the "Establishment": these will include identification of the various role bearers within the Establishment (the ombudsmen, the critics, the propagandists, the epigones) and, in addition, identification of the ideal of science which underlies the criteria which the ombudsmen use in evaluating research work. It will also entail study of how communication systems and organizational forms vary according to the phase in which the tradition finds itself.[23]

It is to be hoped that models of the kind we have outlined may help researchers to improve their self-understanding. For improved self-understanding is essential, if we are to creatively compensate for the negative side-effects of the indispensible research traditions.

Notes and References

[1] Whitehead, A. N., *Process and Reality* (N. Y.), 1929.

[2] Plessner, H., *Die Stufen des Organischen und der Mensch* (Berlin), 1928, esp. pp. 29 ff., 309 ff.

[3] Schelsky, H., *Auf der Suche nach Wirklichkeit* (Dusseldorf, Diederichs), 1965, p. 47.

[4] Kisiel, T., "The Happening of Tradition: the Hermeneutics of Gadamer and Heidegger," *Man and World* 2:358–385 (1969), p. 363.

[5] Apel, K.-O., *Transformation der Philosophie* (Frankfurt, Suhrkamp), 1972, (2 vols.), esp. Vol. II, p. 6; Radnitzky, G., *Contemporary Schools of Metascience* (N. Y., Humanities), 1970.

[6] Gehlen, A., *Urmensch und Spatkultur* (Frankfurt, Athenäum), 1970, esp. pp. 25, 28 f.; *Moral und Hypermoral* (Frankfurt, Athenäum), 1969, esp. ch. 10.

[7] Incidentally, this suggests a passing thought on scientific traditions. There too, the "ethnocentricity of scientific subcultures" is sustained by means of rituals and taboos, such as a special jargon which sometimes may reach the point where esoteric language passes into "esoterrorism," the tabooing of certain procedures as not "scientifically respectable," etc. While such things have a legitimate use, they often are overdone.

[8] See Jones, W., *The Romantic Syndrome:* Towards a New Method in Cultural Anthropology and History of Ideas (The Hague, Nijhoff), 1961; also Kubler, G., *The Shapes of Time:* Remarks on the History of Things (New Haven, Yale Univ. Press), 1962.

[9] Kuhn, T., "Notes on Lakatos," in *Boston Studies in the Philosophy of Science* (Dordrecht, Reidel), Vol. 8, 1971, pp. 137–146.

[10] McMullin, E., "Recent Work in Philosophy of Science," *The New Scholasticism* 40:478–518 (1966). Incidentally, Kuhn has a precursor in R. K. Merton's *Science, Technology and Society in Seventeenth-Century England*, originally published in *Osiris* 1938, republished as a book (Harper & Row), 1970.

[11] Foucault, M., *Les mots et les choses:* une archéologie des sciences humaines (Paris, Gallimard), 1966, p. 503.

[12] For example, G. Bachelard: "La dialectique de la découverte paraît sans cesse aller du pluralisme à la cohérence et de la cohérence à un pluralism multiplié." T. Kotarbiński, also, writes: "[the] transition from one state of harmony to a higher level of harmony occurs through a stage of disharmony." (In *Praxiology:* An Introduction to the Science of Efficient Action (London, Pergamon), 1965, p. 205.)

[13] Historiography attempts to find out what actually did happen; it deals with the unique. To achieve this end, it also needs models of what would have been possible in a given historical situation. This is the distantiating needed in historiography. Physical theory tells us *what is possible* in the material world; thereby it achieves distantiation from sensory experience. (For the "empirical checking" of the theory, physics must attend to concrete instances—their uniqueness being irrelevant—and therefore it needs instruments, in which the researcher becomes "embodied," so to speak.) These characteristics provide a partial definition of the perspective of science—the "scientific tradition"—on the one hand, and of the perspective of historiology (the critical philosophy of history)—part of the "humanistic tradition"—on the other.

[14] Highly relevant material is contained in Ravetz, J., *Scientific Knowledge and its Social Problems* (Oxford, Clarendon), 1971, esp. p. 223, where the term "cycles" is used, and pp. 224–233, 265–271; pp. 226–230 give two illustrative case histories illustrating the life cycle of traditions: French physical science in the early nineteenth century, and the contemporary abstract style in mathematics.

[15] It is up to the historian of science to explain why certain traditions, whose research programs can, with the benefit of hindsight, be assessed as potentially fruitful, nevertheless did not develop into a tradition proper.

[16] Communication between researchers from different specialties becomes increasingly difficult and it is a safe prediction that *the need for "hermeneutic" mediators between scientific specialties (traditions) will become urgent.* Of course even the tradition of *general* culture allows an impressive condensation of information and of associations. When an edition of classic literature has to be provided with an elaborate commentary to make it understandable this is a sure sign that we have lost the capacity to communicate with the by-gone generations and traditions which created those masterpieces of literature.

[17] Apel, K.-O., *Analytic Philosophy of Language and the "Geiteswissenschaften,"* Beiheft No. 5 of *Foundations of Language* (Dordrecht, Reidel), 1965, p. 54 f.

[18] "Contradiction" or "clash" in this context refers to a variety of types of tensions or dissonances of which logical contradiction is but one—the least interesting type (as the dialect tradition has pointed out).

[19] Apel, K.-O., *op. cit.*, p. 55.

[20] For example, the knowledge that the planets move in the same direction and in the same plane was known for a long time. It was a residual vis-à-vis Newton's (a-historical) theory—compatible but unassimilable *in principle*. Eventually it did give rise to a new perspective (associated with the names of Laplace and Kant) in which the historicity of time was restored: the solar system seen as something with a history. But this piece of knowledge got attention only when the dominant tradition (in this case, gravitation research of the Newtonian type) had reached a certain saturation point.

[21] I would like to venture a comment on the psychological-"political" aspects of the ideal-typical phases. Each phase would—in this very schematic picture—have a corresponding ideal-type of personality to which the phase might prove particularly attractive. Thus the Pioneer phase should appeal to a person with high risk-willingness—for whom the utility of success outweighs the disutility of failure. The Building phase ought to appeal to a security-minded person, attracted to methods which, if only reasonably applied, will yield results respected by the exponents of the tradition who dominate the academic system: he feels secure as a disciple. The phase of Internal Criticism should appeal to persons with a need for certainty, but also to those with an aesthetic need for the beauty of exact and transparent theories. The tradition in its Senility phase will attract people who either do not recognize that it is intellectually dead, or who tend to stick to what they once have accepted, and who, being rigid, cannot tolerate any upheavals in the basis of their intellectual life.

[22] Habermas' request that the realization of the "symmetric, repression-free dialogue of all with all" be accepted as a regulative principle is by Schelsky interpreted as a request for the *institutionalization* of critical dialogue (in the tradition of philosophy as enlightenment, striving to reduce as far as possible those contentions which are held dogmatically). On the general topic see Schelsky, H., "Die Funktion des Rechts in der modernen Gesellschaft," in *Jahrbuch für Rechtssoziologie und Rechtstheorie* 1:37–89 (1970).

Shortly before delivering this lecture, I participated in a colloquium on the "Freedom of Science" organized by the *Institut für Interdisziplinäre Forschung* at the University of Bielefeld, where experts on constitutional law discussed with researchers this freedom as it is guaranteed by the constitution of the GFR. I became convinced that the realization of "freedom of science" as the free (autonomous) development of the individual in a special realm of life cannot be guaranteed by the State. Rather, its realization has to be regarded as a political task requiring ever renewed efforts. These efforts constitute but a part—the part specialized to the social settings of research—of the general political effort to work continually for the realization of the individual's right to freedom as guaranteed by the constitution.

[23] A few suggestions concerning such investigations of communication systems and forms of organization: The innovative individual tries to communicate his personal knowledge to a small circle of potential followers. If he succeeds, the research program and the new style of doing research will constitute the takeoff point for a small activist group. Its self-identity depends to a considerable degree on the opposition of its members to the dominant style. The communication system typical of the Pioneer-phase consists mainly of in-group communication, with the individual innovator as central component; yet there is openness to the intellectual market of relevant knowledge and techniques. To be able to sustain the Pioneer-phase for some time organizational leadership is also necessary, to provide the material resources required by the small group. Passing from the Pioneer- to the Building-phase will pose another practical task, that of recruitment: active proselytizing or "sales promotion" for the program, based on commending its fruitfulness (especially for solving the problems of novel knowledge residual to the veteran theory). When some part of the program has been carried out, the next practical task is to get the knowledge that the group members accept as "authentic" promoted to the status of public knowledge, i.e. knowledge accepted in the (majority) of the scientific community in the field (the X-ology). (Feyerabend's recent studies "Against Method" focus on this aspect.) In the Building-phase, the larger the group becomes, the more personal communication ties will be diluted. When institutionalization sets in, the group's self-identity will be diluted and group members may identify the perspective and style of their tradition simply with that of the X-ology in question. System-binding factors become more and more "external"—constituted by the "Establishment" of the tradition that has become entrenched in the university system. Eventually, for some members, communication links to persons outside the group will be more intensive than links within the group. The reason for this may be that novel knowledge is residual to the veteran theories developed within the internal steering field, or that new knowledge manifestly clashes with these theories (and the intellectual milieu has become such that the clash can no longer be ignored), or that doubts about the fruitfulness of the programs arise because the productivity of new knowledge by work within the paradigm is decreasing.

These, and similar suggestions about communication system and forms of organization following from the model of the life cycle of a research tradition, would have to be tested by sociological investigations of typical research group. The result of such empirical investigations may make possible a refinement and improvement of the model.

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Modes of Contemplation Through Actions: North American Indians

JOSEPH EPES BROWN

IN HIS *Study of Religion and Primitive Religions,* Richard Comstock has stated that ". . . the historic religions reveal a high degree of autonomy and cultural differentiation; this means that the structures of the historic religions can be examined apart from their social matrix. By contrast, the tribal religions of primitive societies are integral parts of the social nexus that is the tribe. The religion is almost literally nonexistant when considered apart from its tribe."[1]

Extending Comstock's statement, it may be said that what we refer to as religion cannot, as in the case of the American Indian, be separated from the forms and dynamics of everyday life, or from almost any facet of the total culture; nor as we shall see more clearly, may there be separation from the phenomena of the natural environment. This situation is typical of those religious traditions which still remain close to their primal origins, and which have subsisted at a technological level which does not allow alienation from the environment. One cannot therefore find in these cultures, as far as the actual participants are concerned, the kinds of systematic theological structures which have become so central to most of the historical religions. We could distill out and formulate in our terms such structures, since they are latently there, but the people themselves do not overtly make such abstractions from life and experienced reality. Religious concepts and values, then, are given delineation through the direct visual or pictorial image, through the "symbol," which includes the auditory word or "echo," all of which always have reference to the forms and forces, the voices, of Nature.

I recall my first experiences with the Lakota sage Black Elk, waiting anxiously for him to expound on Siouian doctrine, to talk about religious matters. And yet, when he was not smoking his pipe, or singing with his drum, or playing games with little children, he would be telling stories about the animal beings and the traits and qualities which they represented, or about any of the events of the natural world. It is true that at rare moments he would talk of his intense vision and dream experiences, but these would always be expressed through the beings and forces of the natural environment. It was not until later that I realized that indeed he was talking good "Sioux doctrine," "theology," but not in the abstract; his descriptions were integrated with the experienced reflected reality of the natural world. It was indeed, in the case of a personage such as Black Elk, his entire being, his every act, which was speaking of "religion."

A further barrier to our understanding of primitive traditions may be seen in the fact that within the context of the historical and generally monotheistic religions, only two mutually exclusive theistic possibilities seem to be affirmed. That is, religions are *either* monotheistic or polytheistic, and generally monotheism has been taken as the sign of advancement in civilization. Primitive religions, however, and specifically here the American Indian traditions, do not fit into either one of these categories. Rather, these traditions represent a form of theism wherein concepts of both monotheism and polytheism intermingle and fuse without being confused. Belief in a single unitary God, therefore, does not conflict with, nor exclude, the possibility of belief also in a multiplicity of gods or "spirits." Among the western Lakota and Eastern Dakota of the Plains, for example, the term ***Wakan-Tanka,*** the Great Spirit, or Great Mystery, is an all-inclusive concept which refers both to a Supreme Being yet also to the totality of all the gods or spirits or powers of creation. Such conceptualizations embracing both unity and diversity, or unity in diversity, are typical of the polysynthetic nature of the languages of these peoples, and thus of their modes of conceptualization and cognitive orientations. A man such as Black Elk, therefore, was able to affirm: ***"Wakan-Tanka,*** you are everything, and yet above everything." Abundant recorded materials make it evident beyond any doubt that this type of ultimate affirmation of a Supreme Being was held before the coming of the white man and the Christian missionary, not only among the Lakota, but among most, if not all, American Indian peoples. The contemporary Navajo artist Carl Gorman, speaking from a culture very different from that of the Plains peoples, has recently written:

> It has been said by some researchers into Navajo religion, that we have no Supreme God, because He is not named. This is not so. The Supreme Being is not named because He is unknowable. He is simply the Unknown Power. We worship him through His crea-

> tion. We feel too insignificant to approach directly in prayer that Great Power that is incomprehensive to man. Nature feeds our soul's inspiration and so we approach Him through that part of Him which is close to us and within the reach of human understanding. We believe that this great unknown power is everything in His creation. The various forms of creation have some of this spirit within them. . . . As every form has some of the intelligent spirit of the Creator, we cannot but reverence all parts of the creation.[2]

The implications of this type of primitive poly-monotheism are far-reaching and have relevance to certain theological and existential problems of the historical religions. The one example which particularly concerns us here is the frequent absence today within the historical religions of an adequate metaphysic of nature, or at best—and specifically in relation to the Judeo-Christian tradition—the forgetfulness of such a metaphysic which certainly was present in the origins of the traditions. Such neglect has left the way open, as we currently have seen in an abundance of tragic examples, to abuses of the natural environment. Such abuses are ultimately rooted in the qualitative nature of a people's world view, and no amount of purely technological knowledge can reverse this trend. It is therefore understandable that so many young people today look towards the ethos and world views of peoples such as the American Indian in an attempt to find what their own traditional heritage seems to them to have lost.

Unlike the conceptual categories of the Western man, American Indian traditions generally do not fragmentize experience into mutually exclusive kinds of dichotomies, but tend rather to stress modes of interrelatedness across categories of meaning, never losing sight of an ultimate wholeness. Our animate-inanimate dichotomy, or our categories of animal, vegetable, and mineral, for example, have no meaning for the Indian who sees that all that exists is animate, each form in its own special way, so that even rocks have a life of their own and are believed even to be able to talk under certain conditions. What we relegate to the category of the animal or the birds, implying an inferiority to man, the Indian refers to as "peoples" who, in a sense, have a recognized superiority to man, since it is generally believed that in the order of creation they were here before man, and in these cultures what is anterior has a certain superiority over that which is more recent. It is this belief that underlies the enormous respect shown to the aged among native American peoples. The Indian's own conceptual categories are determined by completely different kinds of premises from those of Western man, and the way is always open for a shifting of levels of reference so that discrete sets may ultimately be unified under a common principle which transcends what to us are absolute differences.

As one of many possible examples of the above concern, it may be mentioned that the Lakota discern a kind of unity underlying what we believe to be very disparate kinds of beings or phenomena, such as spiders, the elk, a bison, birds and flying insects, or even a cottonwood tree. In this case the unifying element is the wind or breath, for all these beings manifest certain relationships to the wind or air. Spiders, newly hatched, are carried on long filaments by the winds; the mysterious whistling call of the bull elk, through the use of his breath, attracts the cows to him; a bison cow, breathing over her calf in a cold winter, can enclose the young animal in a protective film-like sac; birds and insects with their wings utilize and exercise control over the winds; and through the winds a cottonwood tree in season sends out its seed wrapped in "cotton." There is, in fact, a qualitative and comprehensive science of the winds among these peoples which has as its ultimate unifying principle the understanding that as the wind moves, or exerts power over, the forms of nature, and yet in itself is unseen, so it is with the Great Spirit whose unseen presence gives life and movement to all that is. Such modes of conceptualization are often conveyed through mythical expressions which anthromorphize the four winds, naming them as brothers identified with the four directions of space, each with his own particular qualities or forces, but ultimately the four brothers are seen to be the sons of a single named father figure. There are of course other members to this particular family of unlikely associates unified by the wind or breath as principle, and there are also other types of categories, for these and other peoples, based on other unifying principles. Always, however, such configurations are expressed in terms of directly experienced natural phenomena.

In relation to many of the points expressed above, it is important to note that the generally understood meaning of the symbol, as a form which stands for, or points to, something other than the particular form or expression, is incomprehensible to the Indian. For in the Indians' cognitive orientations, meanings generally are intuitively sensed and not secondarily interpreted through analysis; there tends to be a unity between form and idea or content. Here the "symbol" is, in a sense, that to which it refers. This, incidentally, is of course the original sense of the Greek term. The tree at the center of the Sun Dance lodge, then, does not just represent the axis of the world, but it *is* that axis and *is* the center of the world. The eagle is not a symbol of the sun, but is the sun in a certain sense; and similarly the sun is not a "symbol of" the creative Principle, but it is that Principle as manifested in the Sun. This mode of conceptualization was forcefully taught to me by old Black Elk. I used to shoot eagles in order to give the feathers to the old men who very much wanted them for ceremonial purposes; once Black Elk told me, however, that I should not shoot the eagles for in reality I was shooting at himself. Having received intense vision experiences of the eagle he had come to realize a spiritual identity between the eagle and himself; the relationship was clearly of a different order from the merely symbolical. Similarly, when a Nava-

jo singer executes a sand painting of one of the gods, or *Yei*, the painting does not represent the god, but the god is really present there and irradiates all participants at the ceremony with his particular grace or power. It is the same with the chanted word. When a Navajo or Apache singer names a deity, his or her very presence is actualized; or similarly, when the singer chants the mythic event, the reality of the action or the event is neither of the past nor of the future, but of the moment, the *now* of mythical time.

It is not that these concepts of the symbol, or of mythic time, are in real contrast to concepts of the historical religions. The contrast rather is between traditional men generally and the modern man who attempts to live in a desacralized world, and who governs his life through the artificial segments of "clock-time," through lineal projections rather than the circular. If the American Indian traditions speak to us with special force today, it is partly due to the reactions of many against the fragmented quality of our own society. Indian traditions, and of course other "exotic" outside traditions, appear to be more total and less hypocritical; they seem to represent a welcome integrated intensity of participation across a very wide spectrum of experiences. It is noted that aspects of the Indian's world do not become sacralized only within the context of special liturgical occasions (although obviously there are always special occasions where intensity is generated) but rather—as is generally the case with peoples close to their primal sources—it is the total world of experience that is seen as being infused with the sacred.

If very broad generalizations have been made here about aspects of American Indian traditions, it is not through unawareness of the enormous differences across the very diverse cultures of American Indians, but rather, where it is possible to make certain generalizations, it is in those areas wherein there is evidence of a common theme running through all these otherwise distinct cultures. This common binding thread, it is asserted, is found in beliefs and attitudes held by the people in the quality of their relationships to the natural environment. All American Indian peoples possessed what has been called a metaphysic of nature; all manifest a reverence for the myriad forms and forces of the natural world specific to their immediate environment; and for all, their rich complexes of rites and ceremonies are expressed in terms which have reference to, or utilize, the forms of the natural world. It is, incidentally, something of a miracle that so much of these attitudes and expressions has survived to this day as a still living reality at the heart of their cultures, in spite of all the forces imposed on them for acculturation into a world of other and usually conflicting kinds of values. Indeed, if there is such a thing today as "Red Power," I suggest that it really lies in the domain of this quality of the Indians' spiritual heritage, and ultimately not in any other.

Given the above considerations, it should now be clear that if we are to speak with greater precision of modes of contemplation and action for American Indians it will be necessary to examine in greater detail, and through more specific examples, their modes of understanding their natural environment, and the quality of their structured relationships to specific forms.

II

Due to the rich variety of North American Indian cultures, as emphasized above, the following presentation must of necessity be selective and suggestive rather than comprehensive. What is presented, however, should be sufficient to establish patterns of beliefs and associated actions which may at least supply keys for the better understanding of the many religious traditions of Indian cultures other than those treated here. If the majority of examples have been selected from particular groups it is simply due to the author's special familiarity with these peoples, and is not to suggest that any ranking or evaluative criteria are being applied.

To provide an initial general foundation for the more specific treatment to follow, selected quotations are given below, without commentary, from the peoples themselves who believe and have lived the values concerned.

> But very early in life the child began to realize that wisdom was all about and everywhere and that there were many things to know. There was no such thing as emptiness in the world. Even in the sky there were no vacant places. Everywhere there was life, visible and invisible, and every object gave us a great interest to life. Even without human companionship one was never alone. The world teemed with life and wisdom, there was no complete solitude for the Lakota.[3]
>
> *—Luther Standing Bear, Lakota Siuox*

> I meditated often upon the powers in the air, water, and earth. They are the great mysteries. Everything is done by them. . . . When I first began to study beaver medicine, I spent hours on the hilltop and near the waters, meditating and watching the birds, animals, and the heavens.[4]
>
> *—Smoking Star, Blackfoot*

> The elements and majestic forces in nature, lightning, wind, fire, and frost, were regarded with awe as spiritual powers, but always secondary and intermediate in character. We believed that the spirit pervades all creation.[5]
>
> *—Charles A. Eastman (Ohiyesa), Dakota*

> . . . these tribes had their seers, men who had thought upon the problems of life and looked to Nature for instruction. These men . . . discerned in the observation of natural phenomena authority for certain ethical teachings the practice of which would assist towards the welfare of the tribe . . . natural phenomena were the expression of a supernatural power that controlled

all things . . . for Wakanda manifests the value placed upon truth in the orderly movements of the heavenly bodies and in recurring day and night, summer and winter.[6]

—Francis La Flesche, Omaha

The old Indian teaching was that it is wrong to tear loose from its place on the earth anything that may be growing there. It may be cut off, but it should not be uprooted. The trees and the grass have spirits. Whenever one of such growths may be destroyed by some good Indian, his act is done in sadness and with a prayer for forgiveness because of his necessities, the same as we were taught to do in killing animals for food or skins. We revere especially the places where our old camp circles used to be set up and where we had our old places of worship. There are many such spots on our reservation. White people look at them and say: "These Indians are foolish. There is good land not plowed." But we like to see these places as they were in the old times. They help to keep in our hearts a remembrance of the virtues of the good Cheyennes dead and gone from us.[7]

—Wooden Leg, Cheyenne

The birds and the beasts, the trees and the rocks, are the work of some great power. Sometimes men say that they can understand the meaning of the songs of the birds. I can believe this is true. They say that they can understand the call and cry of the animals, and I can believe this also is true, for these creatures and man are alike the work of a great power. . . . We believe that he *(Wakan-Tanka)* is everywhere.[8]

—Chased by Bears, Lakota

When I was a young man I went to a medicine-man for advice concerning my future. The medicine-man said: "I have not much to tell you except to help you understand this earth on which you live. If a man is to succeed on the hunt or the warpath, he must not be governed by his inclination, but by an understanding of the ways of animals and of his natural surroundings, gained through close observation."[9]

—Lone Man, Sioux

The following statement by Mircea Eliade provides an especially appropriate generalized summary to the quotations cited above:

> The cosmos as a whole is an organism at once *real, living,* and *sacred*; it simultaneously reveals modalities of being and sacrality. . . . Nature always expresses something that transcends it.[10]

It may be said that ultimately with the American Indians we are dealing with a quality of cultures wherein action and contemplation are interrelated and integrated. Or, if we wish to make sharper distinctions between meditation and contemplation, it may be said that special ritual and ceremonial acts, as well as the actions of everyday life, constitute meditative acts which open, to the exceptional person at least, possibilities for pure contemplation. A man who is a hunter, for example, is not just participating in a purely mechanical subsistence activity; he is engaged in a complex of meditative acts in which all aspects of his activity—whether they be preparatory prayer and purification, pursuit of the quarry, or the sacramental manner by which the animal is slain and subsequently treated—are infused with the dimension of the sacred.

A person such as a Black Elk was thus able to describe the act of hunting as being—not representing—life's quest for ultimate truth. Hunting is a quest, he insisted, which requires preparatory prayer and sacrificial purification; the diligently followed tracks are signs or intimations of the goal; and final contact or identity with the quarry is the realization of Truth, the ultimate goal of life. Similar examples of hunting as a meditative rite could be presented from the Southwestern peoples, and Frank Speck has shown us the same attitudes as obtaining among the Naskapi, hunters of the Labradore peninsular. The eminent Swedish scholar Ivar Paulson has thus been able to write:

> To man as a hunter the divine became transparent above all in the animals. . . . To be sure, the structure and morphology of the sacred embraces the entire area between heaven and earth which is experienced by man. But because of a very natural mental outlook which is determined by the particular dominant interest of a specific ecotype, it comes to be experienced in more circumscribed sectors of the natural environment.[11]

Similar kinds of meditative or contemplative attitudes are present in a vast range of other types of actions. The Southwestern Pima or Papago, or any of the basket-making peoples, perceived in their acts of gathering grasses and vegetable dyes, and in the weaving process itself, the ritual recapitulation of the total process of creation. The completed basket is the universe in an image; and in the manufacturing process the woman actually plays the part of the Creator. Similarly, in establishing the dynamic interrelationship between the vertical warp and the horizontal weft, the Navajo weaver of blanket or rug participates in acts which are in imitation of the creation of the universe itself. It may be, as indicated above, that the practitioner of such traditional crafts will not be able to analyze or interpret consciously such "symbolism"; nevertheless, through the force of myth and oral traditions, such values are intuitively sensed and participated in with the total being and not just with the mind.

When a Plains Indian woman decorates a robe with porcupine quills, she is not just involved in making a useful object aesthetically pleasing, but as a member of a women's quillwork "guild" she is obliged to fast and pray before

commencing her work, and she must retain a contemplative attitude as she works with the brightly dyed quills. Because of the formal and initiatory nature of the quillworker's guild to which she belongs, the woman will probably be aware of the identity made by the people between the porcupine and the sun, and that the sun is a manifestation of the Creative Principle. The quills, therefore, which she is laying on in geometrical patterns established by tradition, are really rays of the sun and thus eminently sacred. The quillworker has, as it were, trapped the sun, understood as a spiritual principle, upon a garment now of both utilitarian and spiritual value. These are values which are real and operative both to the maker and for the wearer of the garment. Neither art nor what we call religion are here divorced from each other or from life.

Similar modes of spiritual conceptualization are involved in the making of dwellings and ceremonial structures, whether it be the tipi, the domed sweat lodge, or the sun dance lodge of the Plains; whether it be the round or octagonal hogan of the Navajo, or wickiup of the Apache, or the long houses of woodland peoples such as the Iroquois or Menomomini. All such dwellings are created in imitation of the process of the creation of the world itself, and all such structures are conceived to be both a model of the universe, and microcosmically of man, who is also a world containing a sacred center.

A multitude of similar types of meditative acts with their supporting forms could be presented across the great diversity of cultures and in relation to a vast range of expressions and activities. A rich array of major rites and ceremonies of special intensity could similarly be presented for these many groups. I refer, for example, to the synthetic and profound spiritual meanings expressed in the rites of the sacred pipe, or to the elaborate four day communal and sacrificial rites of the Sun Dance in the Plains; reference could also be made to the seven or nine day Navajo ceremonies for the reestablishing of health in a person who has become ill through being in a state of disharmony with the universe; one should also describe the core spiritual dimensions to the complex initiatory rites such as the *midiwiwin* for many of the Woodland peoples. There is, however, one additional mode of participation in the sacred which should be referred to at this point, and in conclusion, for this is as a foundation to all that has been presented above, and it perhaps brings us closest to the most profound spiritual dimensions at the heart of these cultures. I am referring to the retreat or "vision quest" which is universal to all the Indian cultures of the Americas, and which, in the extent of participation by the people generally, gives to these cultures a special spiritual dimension.

It is through the vision quest, participated in with physical sacrifice and the utmost humility, that the individual opens himself in the most direct manner to contact with the spiritual essences underlying the forms of the manifested world. It is in the states achieved at this level that meditation may be surpassed by contemplation. Black Elk has thus said that the greatest power above all in the retreat is contact with silence, ". . . for is not silence the very voice of the Great Spirit." In certain cultures this retreat is initiatory in character for the young men or occasionally for young girls, who seek spiritual sanction for a new and sacred name which should come to them; in the arctic, or among some Southwestern peoples, this retreat is participated in only by those who seek the necessary spiritual power for becoming special religious practitioners, a shaman, a "medicine man," or a "singer," as he is termed among the Navajo and Apache. Among many groups the retreat was specifically associated with the quest for a "guardian spirit," although this is not such a general phenomena as is the vision quest in itself. Among the Plains people the vision quest was especially intensely developed, for here this was an activity that was expected of every young man, and frequently of every young woman, participated in not just once at a certain time in his or her life, but indeed with frequency throughout the life of the individual. No person in these societies, it was believed, could have success in any of the activities of the culture without the special spiritual power received through the quest. It was this development in the Plains that led Robert Lowie to refer to the trait as "democratized shamanism."

The minimal formal elements of the retreat involved the guidance of a spiritual mentor, preliminary rites of purification, the seeking out of an isolated place, usually on a mountain top, and the observance of a total fast. At the place of the retreat special patterns for the participant's actions, and often special forms of prayer, were indicated to the supplicant by his mentor. Essentially, the person was to expose himself, normally for four days and nights, to the elements and to the forms and forces of nature; he should be attentive to whatever might appear to him, no matter how insignificant the being or phenomena might seem to be. If a dream should come to the participant in his or her sleep, this too could be of import. Although the dream was considered to be of lesser power, or as auxiliary to the true vision, nevertheless the person should be attentive to such experiences and should be able to relate them to his guide who may explain their spiritual implications. Indeed, many of Black Elk's dreams seemed to be very close to the vision experience. I recall one such power dream which he recounted to me: "I was taken away from this world into a vast tipi, which seemed to be as large as the world itself, and painted on the inside were every kind of four-legged being, winged-being, and all the crawling peoples. These peoples who were there in that lodge, they talked to me, just as I am talking to you."

Not all who sought, or "lamented," for a vision received the experience. When the experience did come, however, it was in the form of some being, of one of the birds or animals, or of the powers and phenomena of the natural world; usually the being spoke to the supplicant, giving a message revealing some aspect of wisdom which that form manifested or possessed. The supplicant, it was

believed, thus established an identity, not just with the form in itself, but with the spiritual essence of the form which conveyed a specific quality of spiritual power. Gradations of such powers were recognized in accord with the nature of the experience and the type of being which appeared. Frequently the animal or bird might become the individual's "guardian spirit" which would protect him in the events of his life, instruct in specific virtues, or convey skills and qualities of special importance to the activities of the society. Spiritual powers could be accumulated through the frequency of such vision experiences; thus always the great leaders of the community were pointed to as persons who had received powers through many visions. Without the vision a man was considered to be a nobody and could be successful in nothing. Something of this power received by the individual was communicated to the people generally, not only through the special quality of personality of the individual concerned, but also by his being required to externalize the experience publically through a special dance, in the sacred songs received, or through the paintings which he made on his shield or garment. Also, to insure the continuing activation of the vision power within the individual, some part of the animal would be taken and worn on his person, or kept carefully wrapped in a special bundle. Occasionally such bundles could be acquired by others to whom a vision had never come, for it was believed that the spiritual power, once manifested to a particular person, was then operative in and by itself, so long as certain prescribed requirements for the keeping of the bundle were met.

In summary, it may be said in a general manner that within the context of American Indian cultures the vision experience served in an especially forceful manner to render transparent to the individual some facet of the phenomonal world, revealing aspects of a spiritual world of greater reality underlying this world of appearances. It is in and through such qualities of experience that, consciously or not, those barriers are dissolved which have tended to separate what experience has seemed to present as an "outer world"; the vision experience, then, integrates and interrelates these "inner" and "outer" worlds into one experience. The life of a man such as Black Elk has revealed this process to us with special clarity. The beings, or whatever might be involved in the vision, serve as intermediaries, revealing aspects of reality through which the ultimate reality of the Great Mystery *(Wakan-Tanka)* may be contemplated, if not comprehended. The ray of the sun, in this sense, is not other than the Sun itself.

Understood in its total context, we are dealing here with a type of religion, with its specific modes of spiritual realization, wherein, it may be said, there obtains the process of a circular continuum through the domains of action, meditation, and contemplation leading again to action. It is the mysteries of the natural world which provide all the spiritual means.

> We should understand well that all things are the works of the Great Spirit. We should know that He is within all things: the trees, the grasses, the rivers, the mountains, and the four-legged animals, and the winged peoples; and even more important, we should understand that He is also above all these things and peoples. When we do understand all this deeply in our hearts, then we will fear, and love, and know the Great Spirit, and then we will be and act and live as He intends.[12]
>
> —*Black Elk*

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The Foundations of the Aperspective World

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BEING EXTRACTS FROM THE FIRST SECTION OF URSPRUNG UND GEGENWART, THE SECOND SECTION BEING ENTITLED "THE MANIFESTATIONS OF THE APERSPECTIVE WORLD"

From the Foreword of the First Edition, Dated Pentecost, 1949

[xix] WHAT WE ARE PASSING THROUGH TODAY is by no means merely a European crisis. Neither is it just a crisis in morality, economics, ideologies, politics or religion. It predominates not only in Europe and America; Russia and the Far East are also under its influence. It is a world crisis and a crisis for humanity, the like of which has appeared thus far only in periods of change—periods which were incisive and carried with them a certain finality in the life of the earth and of its human inhabitants. The crisis in our time and in our world anticipates a complete process of transformation which can but be transcribed by the phrase "global catastrophe." Evaluated from a point of view which is not merely anthropocentric, this state of affairs must present itself as a new array of planetary dimensions. Soberness is demanded of us; we must face the fact that there remain only a few decades until those conditions are fulfilled. The time of grace is fixed by the increase in technical possibilities, which is in exact proportion to the decrease in man's awareness of his responsibilities—unless a new factor arises on the scene to overcome this threatening situation.

[xx] To point out this new factor, this new possibility, is the task of this work.... Either we overcome the crisis or it will overcome us. Only he who conquers himself will prevail. Either we are liquidated and cut to pieces, or we solve the problem and work toward wholeness. In other words, either time is fulfilled in us—and that means the end and death of our earth and of present-day man—or it is we who succeed in fulfilling time. This is tantamount to attaining wholeness and realizing the present, and synonymous with working to achieve the unification of our primordial Origin (*Ursprung*) and our living Present (*Gegenwart*), and making it real.*

From the First Chapter of Part I, Entitled "A Contribution to the History of Awareness—Basic Observations"

[3] Today, if a person were to look with assurance upon a new epoch of mankind in the making, if he were to voice his conviction that one might be saved from the wreckage and chaos by virtue of a new spiritual attitude and a new and

* In subsequent passages, the author's words *Ursprung*, and *Gegenwart*, will be retained, in order to convey their original value and breadth of meaning. (Ed.)

developing awareness, that person would, without doubt, find fewer believers than those who have prophesied the decline of the West. He who has lived during the time of the totalitarian states, the Second World War and the atomic bomb, appears to be more willing to give up even his last stand than to allow himself to be drawn toward an insight into the possibility of a transition, a renewal, a transformation, or to be prepared for the leap into the morrow by the harbingers of this tomorrow. Otherwise, testimonials to this transformation and the traces of the new and the coming could not have remained unnoticed by him. Such a reaction—this mentality which leans towards disaster—is typical of man in the process of transition.

We are going to report on the making of a new world, a new consciousness—not on the basis of wishful thinking or speculation, but of insights into the mutations of mankind from his primordial beginnings until today, on the basis of possible new insights into the types of awareness which have existed during the different ages of mankind, and of the forces which have led to their existence between the *Ursprung* and the *Gegenwart*, as well as *in* the *Ursprung* and the *Gegenwart*. And, just as the wholeness which existed at the very beginning is the *Ursprung* prior to time, so the *Gegenwart* is, for us, the unity of all that relates to time and the temporal, the Present which, as it actualizes reality, encompasses all phases of time—yesterday, today and tomorrow, and even the pre-historical and the timeless.

The structuring which we have uncovered seems to provide a clue to the foundations of consciousness, and to enable us to furnish a contribution to the history of how man became conscious. This structuring rests upon the
[4] recognition that clearly distinguishable worlds have come to the fore during the development of Western man (and not him alone), whose unfolding took place in mutations of consciousness. The problem which we face thus rests upon a cultural-humanistic analysis of the different structures of awareness, and the ways in which they emerged.

To accomplish this, we use the method of pointing out the structures of consciousness during the various "epochs," on the basis of their peculiar modes of expression in images as well as in languages, as revealed in valid records. This method seeks to illustrate, portray and make visible, sensible and audible, the different structures of consciousness from within, through the means at their disposal, as well as from their constitution.

Thus we shall go back to the roots of human *unfolding*, in order to examine all structures of awareness, moving on from there to our position today and to our present with its own consciousness. Not only can the past and the present be revealed thereby; an inkling of the future will also be afforded to us, that is, we shall get a glimpse of a *new reality* in the midst of the decay of our epoch.

It is our belief that we can recognize the essential characteristics of a new epoch, this new reality, in almost all the forms of expression of our time—not only in the creative works of modern art, but also in the perceptions of modern science and in the humanities. We are able to give this new reality a designation which highlights one of its most important elements, and which readily suggests itself when we call attention to the fact that man's growing self-awareness is most intimately connected with his awareness of space and time.

A new constellation in the structure of consciousness took place barely half a millennium ago during the early Renaissance with the *discovery of perspective*, by means of which space was made accessible. It is so intertwined with the whole attitude of mind of the "Modern Age" that this epoch could be called the "Age of Perspectivity." At the same time, the age immediately preceding the Renaissance may be characterized as the "non-perspective" age. If we recognize a fundamental quality in this characterization, it is easy to arrive at a corresponding designation for the new and dawning consciousness. We can call it an *aperspective* awareness, all the more in that we find it revealed in modern physics no less than in the fine arts and poetry; a first basis of manifestation of the new reality is the inclusion of time within spatial perception as a fourth dimension. We should not take "aperspective" as contrasting with, or as a mere negation [5]
of, "perspective." The opposite of perspective is non-perspective. Between the three formations—non-perspective, perspective and aperspective—there exists the same meaning-relationship as, for instance, between non-logical, logical and alogical, or between non-moral, moral and amoral.

There is one thing which the use of this designation "aperspective" allows us to see clearly, and that is that we should overcome the mere dualism of affirmation and negation. In the so-called "primitive" vocabulary, the sense of opposition is still preserved. In Latin, *altus* means "high" as well as "low," *sacer* "holy" as well as "accursed." Such words still present an undifferentiated, psychically accented unity whose bivalent character was quite obvious to the Egyptians and Greeks. This is no longer the case in our feeling for language and, therefore, we require a term which rises above the bivalence of the original word, but also above the dualism of contradictory concepts. Accordingly, we are employing the Greek prefix *a*, (not in the sense of *alpha negativum*, but in the sense of *alpha privativum*), and joining it to the word derived from Latin, because this prefix *a* has a *liberating* character (from *privare*, to liberate). In the designation "aperspective," we thus express a process of liberation from being perspective-bound as well as non-perspective or even pre-perspective-bound. Our designation does not attempt to unite the non-perspective and the perspective, which *per se* are co-existent, nor does it represent an experiment in synthesis, nor is it a reconciliation of what has become irreconcilable by becoming defective. If the "aperspective" were but a synthesis it would signify

nothing but the rational-perspective and, like every such unification, it would be limited and have only a temporary validity, because every unification is threatened by another discord. *We are uncompromisingly dedicated to wholeness*, and ultimately to *the whole*. This attempt at wholeness is likewise expressed in our word "aperspective."

[7] This is the task before us: To discern the basis for an aperspective world. In undertaking it, we shall seek less support from the results of natural science research than from data taken from culture and from the humanities. Among the cultural and humanistic disciplines, it will be especially linguistics from which we shall gain our insights, for language is *par excellence* the means whereby the individual communicates with the world, and the world communicates with the individual.

It is not a question of providing a postulate. Rather it is a question of expounding the possibilities which are latent in us and in the living present—possibilities which are in process of becoming acute, that is, which are actively working and hence turning into reality. Therefore, in what follows we proceed from two basic reflections:

1. Nothing is gained by a mere interpretation of our age; we need the demonstration of concrete phenomena which, being new, are becoming visible, and changing the face not only of our own time but of time as such.

2. Victory over the present condition of the world, which in all likelihood will soon attain its rationalistic and technocratic peak, may be brought about neither by reason nor technocracy, nor by sermons and admonitions to heed ethos and morality, nor by a regress of any kind....

We shall have to show that *indications of something new to come* may be discovered *in every field of human expression*, and that all of these share a common character. We shall succeed in demonstrating this when we have gathered as exact a knowledge as possible concerning the forms of expression which our own past and present have assumed. Therefore, it is our first task to work on the foundations of the new consciousness as well as of the new reality arising from this consciousness....

From the Second Chapter of Part I, Entitled "The Three European Worlds"

1. The Non-Perspective World

[13] Nowhere may the change in the European world-feeling and world-view be so clearly read as in painting and architecture. Only an insight into this change will properly illumine the nature and significance of new styles and modes of expression.

In the plethora of styles exhibited in the graphic arts of post-Christian times, we can distinguish two great epochs, complete in themselves, and subsequently a third which is still in its initial stages today. The first epoch, already closed, comprises the time up to the Renaissance; the other, about to be closed, reaches into the present. The decisive and distinguishing characteristic of these epochs is the absence or presence of perspective. We therefore designate the first epoch as "non-perspective," the second as "perspective," and the new epoch now in process of manifestation as "aperspective." It may soon become obvious that these designations not only have aesthetic and art-historical validity, but also cultural, humanistic and psycho-historical validity. The realized perspective signifies the exploration or, we might say, the process of becoming aware of, space. The perspective not yet realized signifies that space is still asleep in man and that man is still asleep in space, since he has not yet become aware of it....

2. The Perspective World

The perspective world, whose preparation began in late [16] antiquity in the Mediterranean, found its first expression in the European-Christian world about the year 1250. In contrast to the Egyptian body-feeling—which was hieratically bound, canonical, almost stereotyped, impersonal and pre-human, and thus still non-existent in our sense—the Greek body-feeling manifested a certain individualization of man. But it was only at the end of the Middle Ages that man slowly became conscious not merely of his own body but of his body as the carrier of his self. Henceforth he was not merely a human; he was this one, this certain man; he was no longer mirrored in an idealized representation of a type—whether of a Caesar, a philosopher or a poet—but in a portrait such as those created by Jan van Eyck.

A comprehension of man as subject is conditioned by a comprehension of world as object. This objectification of external reality comes tentatively to expression in Giotto's paintings. Early Sienese painting, especially miniature painting, is a non-spatial, flattish world communicating internally, which derives its viability from its symbolic content and not from what we today would call the content of reality. The "pictures" of the non-perspective period were painted, as it were, at night-time, when things are shadowless and flat, when darkness has swallowed up space so that only its immaterial psychic component remains to be expressed. With Giotto, however, space became visible. An entirely new spatial consciousness was beginning to break out of the soul into the world....

By virtue of the perspective, not only is space made [26] visible and brought out into the daylight of waking consciousness; man himself thereby attains visibility. The gradual possession of the perspective, which became the principal concern of Renaissance man, had the effect of expanding the world image, yet simultaneously of narrowing it through the spatialization. We are suffering

from the consequences today. For to see or to think perspectively means to see and think with spatial fixation.... Man, who himself is merely part of the world, concedes ("makes room for") his own part, and provides a dominant position for the partial view to which he alone has access. In consequence, the part predominates over the whole. The whole, then, is no longer to be approached or approximated on the basis of this perspective attitude toward the world. Instead, we endow the sector with the "character of wholeness." The result is the sufficiently known "totality." (It is not by chance that the first three letters of this word "totality" let the ambivalence of the original Latin word *totus* shine through. *Totus* more recently signified "whole" and "all," but earlier it may have also signified "nothing.") The whole, which can no longer even be approached from a perspective position, will, however, become once more approachable in fresh and novel ways from the aperspective attitude....

3. The Aperspective World

[39] Aperspectivity expresses itself in a structure of consciousness which is in process of emerging and is, therefore, new. Thus it cannot be made perceptible in all its consequences—positive as well as negative—until certain concepts, attitudes and forms of thought which were previously (and are still) valid have been studied more closely. Without this clarification we would lapse into the mistake of expressing "that which is new" in "old" terms which have become inadequate for this purpose.

For this reason we shall have regard for those incisive events which we would like to call *mutations in the consciousness of mankind.* The results of such mutations are latent within each of us in the form of different structures of consciousness, and since they constitute our own being, they are at work in us.

From the Third Chapter of Part I, Entitled "The Four Mutations of Consciousness"

1. Development, Unfolding and Mutation

[41] Something new can only be discovered if one is aware of the old. The adage that there is nothing new under the sun is only conditionally true. Everything has, indeed, already been—but in another manner, in another light, under different value systems, in some other realization, in another manifestation.

The first approaches to a heliocentric world image in Aristarchus, a theory of relativity in Zeno, an atomic theory in Democritus, a spatial concept in Euclid—as well as those other first breakthroughs leading to demythologizing logic in Socrates, autobiography in Plato in his *Seventh Letter*, historiography in Herodotus—all these attempts are anticipations of later flowerings, seedlings which, because of the lack of nourishing soil or of receptivity during their epoch, were not capable of being actualized in their own time, and consequently did not immediately become tangible and effective.

So, similarly, did the first generation in our century reject its new discoveries. Still more, by fostering a movement regressive in character, it believed it could undermine the very foundation that reared these discoveries.... For acceptance of what is "new"—and willingness for it to become manifest—always meets with fierce resistance, because it demands the overthrow of what has been handed down for ages, acquired and painfully secured.

But new situations also pose a threat arising from our inability to understand them, because we are still too enmeshed in the old structure of awareness. Thus what is "new" looks as if it were beyond the real—as if it were, perchance, supernatural. And it not only appears that way; considered on the basis of the structured awareness, it *transcends* the reality one is accustomed to; it *is* [42] actually *way beyond.* Then the only thing that can save the situation is the attempt to accommodate the new to the old. Of course, in so doing the new loses it character of genuineness and truth. In attempts to explain the new by concepts rooted in tradition—instead of by projecting it in its originality against the ancient background—misunderstandings, misinterpretations and wrong attitudes are bound to arise.

In order to avoid these misconstructions and do justice to the originality of the new, we have to realize that the complete novelty of a situation must be appreciated if it is not to be hopelessly wasted in its adjustment to living reality. However, this can only be accomplished if one is clear in his own mind about what has gone before. It is because of this that we wish to look at a unique human event: the unfolding of consciousness.

In reviewing this endeavor of human beings, we may distinguish three different structures of awareness emerging from the archaic structure: magical consciousness, mythical consciousness and mental/rational consciousness. If we succeed in working out the contents, forms of realization and attitudes toward life which are the manifestations of these structurings, we will be able to state to what extent one or the other not only preponderates in us as individuals, but determines our behavior with respect to the world and our judgment thereof. Having done this, we might also attempt to weigh, describe and form judgments regarding the new structure, without danger of mixing the old with the new. We would like to designate this new structure the "integral structure" of consciousness, and the modality of the world in the process of emerging the "aperspective world."

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However, before we turn to a consideration of the structures of consciousness, we must clarify the critical value of

the proposed structural differentiations. Should we undertake to portray what we have been accustomed to call "the evolution of mankind" in its temporal procession, we should have to keep in mind that this is merely an attempt at structuring the past for the purpose of making a survey. Concepts such as "evolution" and "progress"—whose interpretations often mislead us—we shall eliminnate to the extent feasible. Thus we shall regard the comfortable idea of a progressive, continuous development as antiquated. It may be that this concept of development was once a good working hypothesis. But in time it was taken to be a universally valid reality, whereas it is this
[43] only in a limited sense, as evinced in the well-known consequences of the biologically oriented concepts of Spengler. No really decisive process which is more than a mere activity running almost helter-skelter—now progressing, now retrogressing—*does* go on continually; it proceeds discontinuously, in quanta, or by leaps. Or, if we want to formulate this in biological rather than physical terms, we can say that such an on-going process is mutable, that is, it operates *in the manner of mutation*, spontaneously and indeterminately, by leaps. We are introducing this concept of mutation because we are able to perceive the processes which are going on invisibly only when these have become sufficiently strong and virulent to manifest themselves. It is most especially when applying this concept to psychic processes that we must introduce this limitation. What appears to us as continuous is nothing but a series of stages of transition we have subsequently introduced into the course of events, and by means of which we endow what is happening with a logical, causal, determining and final character.

What we are saying is intended to make unmistakably clear the kind of mutational event we are referring to: It is neither biological nor historical, but spiritual or ideational. Let us place all possible emphasis on this point.... It could be that our concept of mutations of consciousness has a biological anchorage, being conditioned anatomically in the brain. However, it must assuredly remain an open question whether we are dealing with an organically conditioned, indigenous development or a change "evoked" by the indwelling ideational prin-
[44] ciple. The anchorage of which we speak consists in the cerebral changes which apparently occur *ex nihilo* and then become inherent, and whose possibility Lecomte de Noüy weighed with the necessary caution. Although these reflections were rejected at that time (around 1950) by brain research, Hugo Spatz seems to have demonstrated recently (around 1960) in brain anatomy that there do exist tendencies in brain changes which make new recipient capabilities possible.[1] If that is the case, it would be equivalent to an ideationally conditioned development process which evolved during the mutation of consciousness from the magico-mythical to the mental/rational....

Regarding the interpretation of mutations in consciousness springing up in the biological realm, we must make the guarded observation that by virtue of our definition the terminological transposition of a concept here as elsewhere is quite proper. Or, to refer to an example which Erwin Schrödinger has quoted, should medicine and algebra alone be permitted to utilize the same terminology for different realities? Likewise, biological mutation and mutation in consciousness, though sharing a name, are otherwise far apart. There is no reason why we should find a substitute for this term; even in biology it has assumed a metaphorical character in that we distinguish not only between micro- and macromutations but further between subspecies of "mutations" and competing types of "mutations." We have, at any rate, chosen this concept for our own, and mean to retain it.... Our reason is that it best depicts the leaplike processes in consciousness which have occurred ever since the *Ursprung*. Moreover, it enables us to keep our distance from such concepts as progress, evolution and unfolding, which have become a thought-necessity today. The rational cliché of "progress" (which is for the most part only a progression from the *Ursprung*), the biological idea of evolution, and the botanical idea of unfolding, are not applicable to the phenomenon of consciousness. On the other hand, the concept of mutation, in the sense of an abrupt, discontinuous event, underscores the spiritual or ideational content grounded in consciousness dating back to the *Ursprung*, as well as the transposition into consciousness of factors given in the *Ursprung* [as ground of possibility]. Every mutation in [45]
consciousness is apparently occasioned by the sudden eruption of possibilities latent since the *Ursprung*. In a way quite different from biological mutation, none of these mutations of consciousness is responsible for the loss of previous possibilities and properties, but suddenly incorporates them into a new structure. All this appears sudden to us only because (as we have already pointed out in *Abendländische Wandlung*) certain "processes" (insofar as one can speak of processes at all) take place apparently outside spatio-temporal comprehension and "conceivability," so that we are not able to place the causal nexus in time and space. [These the English-speaking community might speak of as *emergent*. (Ed.)] But we know today that the *Ursprung* "existing" prior to space and time makes its presence felt in the mutations of awareness,

[1] Though not widely known as yet, particular forms of organisms and their behavior patterns may be *persistent* in a population though not genetic in the sense of being absolutely determined by the genes. The gene-pattern allows many options which may be realized or not depending on the relationship of a developing organism with its environment, especially as it passes through "critical periods" in its maturation. In a particular environment, the developmental program of an organism will unfold in a characteristic manner. With a change in environment, a different morphological or behavioral expression may emerge and "be inherent" as long as those new conditions prevail. This has been found to be true of body-form, shape and function of organs, and psychological capacities such as intelligence. [Ed.]

which intensify or integrate consciousness, as the case may be. The time span during which such a process is operative corresponds to the width of the dispersion pattern, since it affects mankind as a whole at any particular period. . . .

Let us state once again: Mutations of consciousness are associated with concepts like progress, evolution and unfolding at best only dialectically, in psychological or biological terms. But if we do this we take from the particular happening the character of its source, an *Ursprung* which is *spiritual or ideational in nature*. Within the mutations of consciousness there takes place a process of rearrangement beyond the reach of mere space-time-bound events, an [emergent] process, which manifests itself discontinuously, or by leaps and bounds. These are the transpositional processes which have made possible the assimilation of the ideational orientation of the *Ursprung* throughout the consciousness of man. The *Ursprung* itself rises in consciousness through *mutations in awareness, which are integrational processes*.

If this discussion has concerned the non-biological aspect of mutations in awareness, let us now prevent a further misinterpretation resulting from our rational habits of thought: the historical one.

In turning a deaf ear to the concept of a kind of transformation or mutational event which is determined by spirit or mind, many people are inclined to seek refuge in "technical progress," abandoning themselves to *hubris*—in spite of the fact that such arrogant pride in activity has lost its justification, insofar as it could have any justification. Defenders of the idea of progress assert that our age and our civilization are synonymous with a superior development, but this view has clearly been put in question by their very achievements, and most especially by the way in which they have been applied. The results, *and their applications*, show that we must guard against self-esteem of whatever kind, and especially presumptuous overestimations—above all, the one fostered by the biological postulate of a development into something higher and better, which has engraved itself deeply into the European mentality. . . .

[48] Comte's postulate, which is purposive and goal-directed (and which reveals his perspectivistic fixation) has a teleological and final character. His angle of vision—which we might almost term a biological reductionism and which has a fragmentizing character—and, above all, his developmental thematics prevent Comte's theory from paralleling in any way what we have designated as the "four mutations of consciousness." The apparent arrangement of the mutations in sequence is less of a biological "development" than an "unfolding"—a concept which admits the participation of an ideational reality in the mutation. In no case is this unfolding to be understood as a progression. "Progress" is not a positive value, even when thoughtlessness has made it so; it is also a progression away from something, a putting of distance between things, a leaving behind of the *Ursprung*. With every new mutation of awareness, consciousness unfolds more powerfully; in contrast, the concept of development, which is associated with continuity, allows no room for the possibility of mutation, which is discontinuous. . . .

We must guard against still another mistake, namely, that a voluntaristic or will-determined emphasis be put upon the mutation of consciousness. The anthropocentrism of voluntarism—by which we mean the doctrine of will centered in man, with its evident perspectivist-atomist character—cannot be entertained when we do not know to what extent man's will possesses power and influence over the mutations of consciousness that develop within him. From our presentation of how perspectives are gained (which we have tried to keep as objective as possible), it should become clear to what extent the generations between the years 1250 and 1500 were *possessed by*, not merely *had*, the urge to realize space.

Mere regression, what is more, is just as inadequate in [49] this connection as are ideals of progress, development, voluntarism, positivism, and the like. It is *the leap*, which is in preparation within us, that we must realize. And, the better the springboard—the broader and more secure the basis for the leap—and the more conscious we are that it is taking place, the better the prospects of its success. If the leap miscarries, however, then the possibility of an [50] ensuing process of atomization will block every further unfolding of a new mutation.

In order to gain a foothold for the leap, we shall offer as a working hypothesis the four or five different structures which we have designated as the archaic, the magical, the mythical, the rational and the integral. Withal, however, *we must always keep it in mind that these structures have by no means the character of the past tense, but are present in every one of us today, sometimes more or less latent, sometimes in quickened form*. Only by establishing facts thus far often overlooked, and raising these facts into consciousness, will it be possible for us to view things holistically. . . . Thus we are not merely offering our mutational theory of developing consciousness in place of other types of evolutionary theory; after conjuring up the past as a present awareness, we also include in our observations the future as being already present in us, because latent. We not only leave open the possibility for a new mutation of consciousness embodied in the new structure of an integral "consciousness" of the aperspective world; we bring it closer to us. This means that we are, indeed, incorporating it into our present-day reality. . . .

2. *The Ursprung of the Archaic Structure*

The structure "lying" closest to the *Ursprung*, that which, [51] as one might suspect, is initially identical with the *Ursprung* itself, we shall designate as the archaic structure. "Archaic" is derived from the Greek *arché*, meaning

"beginning" or "origin." We stress the word "origin," which according to its nature is ever-present—a quality not contained in the word "beginning." So far as the choice of the word "structure" is concerned, let us say that structures, as distinct from "planes," (which imply something spatial and hence foster the mode of looking at things in perspective), are no mere spatial textures but may indeed be textures of a space-time or even non-space-time character.

[52] The first structure is zero-dimensional. Thus we restate our position that this first structure is of a space-time nature, although our present-day imagination can realize such a state of affairs only paradoxically. It emerges by itself from a perfect identity which, in its initial stage, it may still have well represented. It is closest to, if not identical with, the biblical paradisiacal primal state. It is the age when the soul still sleeps; thus it is the dreamless age, the period in which there is a complete lack of separation or distinction between the individual and the whole.

Now, if we look around for statements concerning this age we find very few precise indications in the writings of this early time. There are only some general and predominantly mythical ideas, such as the androgyneity (bisexuality) of the Protanthropos, primal man, who represents and embodies this first structure. Furthermore, the reports contained in these writings (which are, though not incorrect, certainly insufficient) convey only in fragmentary terms the time, the event, what happened, what the characteristics are, or what pronouncements they refer to. . . .

[53] Regarding direct, precise statements, the kind of tangible indication which our age prefers, we have found only two that pertain to the archaic structure and indirectly characterize it. They are of Chinese origin, from the end of the mythical period of this most ancient tradition. One of them we meet in Chuang Tzu, where we find the statement, "The true men of the earliest time slept without dreams. . . . The soul is nurtured as it communes with Sleep."

[55] Quotations from Chinese and Greek sages, replete with extraordinary consequences and revealing never before glimpsed backgrounds, say more about the archaic structure than our retrospective conclusions or projections can. Whoever ponders these quotations, and is able to bring them alive as a present reality, will also be able to glimpse therein the bright presence of the *Ursprung*, the first glimmer of an age when world and man were just emerging, an age which looms out of the far-distant past, but which, nevertheless, is present within our own being. Whoever does so, however, will remain silent.

3. The Magical Structure

One or two other structures should probably be interposed between the archaic and the magical structure: one that is "non-archaic," and one that is "pre-magical." However, to the extent to which we have examined the material, it appears to lack any firm indication of how such intermediate structures can be formulated in rather precise terms. Consequently, the magical "epoch" encompasses in our view not only a large "space of time," but also different forms of manifestation and unfolding which may be separated from each other only vaguely. We shall try to obviate any consequent obscurities by considering all those forms and manifestations of magical man which exhibit this trait: the process of man's emergence from the zero-dimensional, archaic structure of *identity* into a one-dimensional structure of *unity*. And we shall further see that the ideal symbol for one-dimensionality—the point as basic element of the line—is illuminating and significant as a reference-characteristic of magical man. The point, which, on the one hand, indicates the first "centering" in man which will later lead to his self, is, on the other, an expression of the one-dimensionality of the spaceless and timeless condition in which man lives in the magical period.

In the magical structure, man becomes dissociated from the "harmony," from his identity with the whole. Here is the onset of a first state of becoming aware. . . . And thereby there emerges the necessity for him not only to *be* in the world but to *possess* it. The more pronouncedly he detaches himself from his identity with the whole, that is, becomes "conscious" of a *portion* of this identity, the more [56] he begins to become a *particular being*. At first he is not capable of recognizing the world as a whole; he is conscious only of its particulars or "points," and thus takes them for the whole. The magical world is, hence, also a world of the *pars pro toto*, in that the part can and does stand for the whole. . . .

The five characteristics of magical man are: his selfless- [58] ness, his unitary point-like world, his spacelessness and timelessness, his interconnectedness with nature, and his magical response to being thus interwoven—which gives him power and makes him a creator. Responsibility is lodged in the external world and its objects, a sure sign of egolessness. The point-related unity is grounded in a vital nexus fixed in nature, not a rational causal nexus. . . .

The point-oriented unity mentioned above has the [59] working characteristic of reality only in a spaceless and timeless realm; in the external world it is unreal. This space-timeless unity is such that every "point" (we introduce this symbol without distinguishing it from thing, event and action), every unity within the unity, may derive from every other "point" independently of time and place and, hence, may be absolutely divorced from any and every rational causal nexus. Every point, be it real or unreal, whether it be bound causally or only symbolically into the whole, not only may be connected to every other point but *identified* with it. Or, to express it better, it is made one with it. One point may with full validity and effectiveness take the place of another. . . . How very ef-

[61] fective this interchangeability is can perhaps be most clearly illustrated by the fact that the suffering of the sacrifice in the ritual permits such vicarious identification. Exchange in the magical sphere is by no means deception; it is a genuinely valid expression of what is "equal."

In this equal validity of the whole and the part, there appear two further essential features of the magical world, which consist of the perspectiveless equality of place and equality of value. Equating has as its consequence what we could call analogical or associative thinking, which is less a "thinking" than a fortuitious association supported by the analog. Herein lies the root of magical man's feeling that things which seem to be similar are mutually "sympathetic"; he connects them by virtue of the *vital nexus, not the causal nexus.*

4. The Mythical Structure

[72] . . . Let us focus only on decisive elements. If the characteristic feature of the magical structure was the becoming aware of nature, then the characteristic feature of the mythological structure was the *becoming aware of the soul*, of the essence of man. Natural time, which became conscious in slumbering magical man, is a prerequisite for a dawning awareness of the soul in mythical man. Whenever we encounter seasonal rites, in the later period of the magical structure—above all in astronomical pronouncements and calendarial forms found first in the Babylonian civilization, then in Egypt, Mexico and elsewhere—the mythical structure is in preparation. These facts signify the close of the period during which man became aware of nature. Thus the rhythm of nature became time-laden in a natural way. This is the decisive step which magical man took when he emerged from the womb of nature. . . .

[76] If the archaic structure is an expression of zero-dimensional identity and original wholeness, if the magical structure is the expression of one-dimensional unity and oneness with nature, then *the mythical structure is the expression of a two-dimensional polarity.* If the archaic structure led, through loss of wholeness, to a unity in the magical structure, foreshadowing an increasing awareness which was dawning in man through a process of individuation, the magical structure brought about his extrication from nature through his struggle against it, which made him aware of an external world. Now, the mythical structure led to an awareness of the soul, that is, of an interior world. Its symbol is the *circle*. . . .

[78] One further point should be made. If we look upon myths from the point of view of a growth in consciousness, surprising and illuminating results become evident. The mythical structure is typified by imagination (from the Latin *imago*, symbol or picture), and thus is distinct from the magical structure, which is characterized by emotion. In the magical structure, the felt connections become conscious and externalize themselves in emotional forms, in activities—the emphasis being on urges and instincts which underlie affective reactions, such as sympathy and antipathy. . . . The mythical structure, in contradistinction, has an imaginative awareness of images which is reflected in the symbolic character of the myth and is responsive to the soul and to heaven, the cosmos of the ancients. It is still remote from space-awareness, but already close to time-awareness. The symbolic consciousness still fluctuates between the magical timelessness and the cosmic-natural time-bound sense which is by degrees becoming conscious. The more remote from awareness a myth, the more timeless it is; its ground is as blind as the back of a mirror. . . .

5. The Mental/Rational Structure

The mental structure has already been mentioned in our references to the perspective world. But in that connection, we had to view everything more or less from the perspective point of view of the year of decision, 1500. This was the moment when the European perspective finally came to the fore, through mutation out of the non-perspective world of the Middle Ages. If we try to describe the mental/rational structure in the present setting we must proceed from another point of departure, not by [87] glancing at the past but by embarking on a voyage beginning in *the Ursprung leading to our time*, which takes its start in the mental structuring of consciousness of Western man. . . .

We have two reasons for choosing the designation "mental" to characterize the structure of consciousness still prevailing. First, the word harbors an extraordinary abundance of relations in its original root, which in Sanskrit is *ma*, and from which secondary roots such as *man-*, *mat-*, *me-*, and *men-* have been derived; all the words formed from this root express definite characteristics of the mental structure. Secondly, this word is one which stands at the beginning of our Western culture, for it is the first word in the first line of the first song of the first great Western pronouncement. This word "mental" is contained in the *μηνιν*, the accusative of *Menis*, with which the *Iliad* begins.

In pronouncements which emanate from the mythical structure, nothing is accidental; speech totally embodies meaning. It is surely significant that it is with just this word that the renowned early statement begins—a statement which, for the first time within our Western world, not only evokes a picture but describes a ceremonious act directed by man (not exclusively by the gods), in an ordered or causal course of events.

Thus we are dealing with *directional thinking*, which comes tentatively out into the open. If mythical thinking (insofar as one may designate it as a "thinking" at all) was an imaginative, symbolic projection, which took place within the confines of the circle with its polarity, directional thinking is radically different. It is no longer polarized, that is, enshrined in and mirroring polarity; it is

object-oriented and hence turned toward the objective world. Deriving its power from the individual self, it established the self-world duality.

This process is a happening so extraordinary that it literally shook the world. By means of this event, the protective circle of the soul—the incorporation of man in the embrace of a world-soul, wherein he lived in polar relationship with nature, cosmos and time—has been blasted. The ring has burst; man steps from the plane into space, which he will attempt to conquer in thought.
[89] Something unheard of has happened, something which has changed the world in its very foundations.

6. The Integral Structure

[119] Here we shall merely venture to point out the first indications which, in our opinion, point toward a new mutation, that of an integrated structure—although these tendencies can only be recognized from the "standpoint" of the integral structure itself, that is, retrospectively. But even the bare mention of this mutation can cause misunderstanding, because what we have thus far discussed is inadequate to make it intelligible. However, we shall try to outline the foundations of the integral structure as clearly as possible, so it will conform to what constitutes the essence of a foundation—the exact staring points of the rising edifice. In this case, however, the edifice has, in addition to a spatial character, a concrete time character. It is thus, in its structure, fundamentally different from the traditional concept of an edifice. This is especially marked because the mental process of time-concretizing may "lead beyond" a mere synthesis of time and space.... For, if we synthesize, we lapse back into duality in spite of all our efforts toward unification.

[121] Concretization is one of the fundamental principles of the integral structure. Anyone who wishes to integrate must not merely have concretized phenomena, be they of a material or mental nature; he must have the ability to concretize his own structure. That means, among other things, that not only do the different structures become diaphanous (or transparent) and conscious in him, but that he becomes aware of their effects upon his own life and destiny. It means, furthermore, that by virtue of his own insight he must acquire mastery over the deficient elements working within himself, so that they may attain that degree of maturation and equilibrium which is a precondition of every concretization. Only those components which have thus become equilibrated—matured and mastered concretions—are capable of becoming building stones in integration. The difficulty in this procedure is that we have to be concerned with an ability to adapt ourselves through awareness to the different degrees of consciousness in the individual structures. Not until they are integrated as a result of concretization can they become, not mentally illuminated, perhaps, but *integrally transparent and present*....

From the Eighth Chapter of Part I, Entitled "The Foundations of the Aperspective World"

One difficulty which many will deem insurmountable consists in the fact that no "idea" of the aperspective world can be formed. That world *transcends our ideas*. In like manner, the rational world at one time transcended the capabilities of mythical man to experience it. Nevertheless, our mental world became a reality. Whoever objects to the aperspective world as incomprehensible and undemonstrable founders only because of the limitations of his own *idea* of the world, fettered as it is to comprehension and visual perception. Apart from that, it may irritate some that we speak of *arational* possibilities, and that this arationality is to be confused neither with the irrational nor with the pre-rational.

It may have appeared from our discussion that we do not reject either rationalism or irrationalism. Such rejection we leave aside, since it does nothing but pay homage to dualism, which is a view to be superseded. For the rationalist, everything nonrational is abjectly irrational, just as for the Indian our optical world is *maya* (appearance). Indeed, we went so far as to present even the *prerational* as not only having validity in the past, but as still active today from within its own structure which, along with other structures, is part of our constitutional make-up. Over and above that, we spoke of the impossibility of losing the archaic structure altogether, inasmuch as its *Ursprung* is still present within us.

Just as the magical structure is almost impossible to represent, since it can be distinguished only by experiencing it, just as the mythical structure is also difficult to represent and is distinguished by its capacity for being experienced, just as the rational structure is merely thinkable and demonstrable, and is only to a small degree capable of experiencing or being experienced, so the integral structure is difficult to represent, and is distinguished only by geing *perceptible*. . . .

Perception is not merely observing (which preeminently typifies the mental/rational structure), but is a *conjuring up in the now of all forms of appearance and expression*. Consequently, perception is capable of apprehending the Diaphane (transparent luminosity), which cannot be realized by merely seeing, hearing or feeling. Let it be emphasized once more: *Perceiving is not a transcendental or supersenuous act*. Concepts such as intuition and the like would be absolutely out of place were we to use them here to characterize what we mean by perception. Perception is, rather, a holistic happening, a holistic condition of the self ("Sich"). It makes for focussing on the now, and diaphanizes of its own accord. One can neither hear, nor show, nor see the Diaphane. But through perception, the world which is merely heard, merely displayed, merely seen, becomes the living presence of wholeness.

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